

PQIS

**Petroleum Quality
Information System**

2001

Notes

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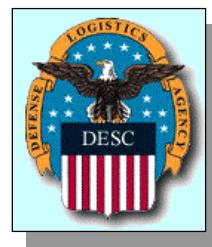


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31 May 2002

PETROLEUM QUALITY INFORMATION SYSTEM FUELS DATA (2001)

This is the Defense Energy Support Center's (DESC's) sixth installment of what is recognized by the petroleum industry as a very beneficial annual report used to monitor fuel quality trends and to research quality issues around the globe. Users of these annual reports include the product specification developers (Government/commercial), contracting agencies (Government), manufacturers, and general interest parties (i.e., OEMs, fuel handling equipment manufacturers, etc.). This report includes statistical summaries of information for Aviation Fuels, Fuel Naval Distillate (F76) and Gasoline.

In our continuing efforts to realize the full potential of the PQIS Program, two goals were achieved for this report. The first goal was that part of the data used in this report was collected electronically using the Paperless Ordering and Receiving Transaction Screens (PORTS). PORTS is an Internet-based program which collects quality data from refineries for shipments of bulk refined products under DESC contracts. Test data information associated within PORTS to individual shipments is collected in the PORTS server. The data was then sent to a temporary PQIS data file, screened, and imported directly into PQIS. Approximately one quarter of the test result data for year 2001 was posted in PQIS in this manner. The second goal achieved for this report was a 100% representation for all bulk fuels purchased by DESC worldwide. Special thanks to the Fuels Quality Assurance Representatives (QARs) of the Defense Contract Management Agency (DCMA) and representatives from the refineries under DESC contracts who have worked with the DESC PQIS Team to insure complete representation of purchased fuel. The result is the only worldwide comprehensive data repository of test results for refined fuel properties. This report contains statistical summaries for over 12.2 billion gallons of product representing over 25,600 shipments.

As always, any comments and questions pertaining to this report and recommendations for future reports are welcome. Please contact Mr Kenneth Henz at Commercial (703) 767-8356 or DSN 427-8356, e-mail khenz@desc.dla.mil, for these issues and to obtain additional copies of this report or the CD-ROM.

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Executive Summary

This sixth annual edition of the Petroleum Quality Information System (PQIS) report continues the convention of providing statistical assessment of fuel properties compiled in the PQIS database. Fuel is procured every year under contracts let by the Bulk Commodity Business Unit (CBU) of the Defense Energy Support Center (DESC). Evaluation of properties is based on test data submitted in a standard test report format with fuel shipments. This report follows in review of overall and regional trends for selected fuel properties, comparing totals documented for the period 1997 through 2001, and like values from 1999 through 2001. The first three annual PQIS Reports chronicled aviation turbine fuel grades JP-5 and JP-8, NATO codes F-44 and F-34, respectively; with minimal reporting on JP-4, corresponding to F-40. The 1999 edition added expanded data on JP-4, to the reporting on aviation fuels, and introduced data for Naval Distillate fuel, F-76, and motor gasoline. The 2000 edition continued the same coverage but showed a drop in JP-4 data, reflecting a downturn in its use. This edition reveals a reversal of the trend with JP-4; and no data on AN-8, since there were no procurements in this reporting period.

Though required reporting in test data, the naphthalene and olefin contents of JP-5 jet fuel are not driven by DoD specification limits for these properties. Although the olefin limit was deleted from the U.S. JP-4, JP-5, and JP-8 fuel specifications in 1999, test results for both aromatics and olefins are determined by the same method and some refineries report both. This report still compares against the old standard. It should be noted that military specifications were used to procure these fuels for the U.S. government. As such, the trends noted in this report may not necessarily reflect those seen in industry; since the military fuels are, in some cases, specially blended to meet U.S. government requirements.

The Office of the Secretary of Defense, Energy Policy Directorate, authorized the establishment of the PQIS database in 1989. The intent, with automated data processing, is to facilitate garnering and the dissemination of standardized quality control data, as well as tracking trends in product quality. It expedites data interchange through electronic access, its analysis, and promotes a comprehensive approach in addressing quality issues.

As in previous reports, histograms chart the distribution of 2001 test results to the volume of fuel represented. Tables show statistical summaries of minimum, average, volumetrically weighted average, and maximum values for selected test properties; segregated on the geographic source of the fuels. Regions 1 through 5 correspond to U.S. Petroleum Administration for Defense Districts (PADDs), denoting areas of the United States supplying the fuel. Properties of fuels procured from outside the U.S. are reported under Region 6, the Middle East; Region 7, Europe; Region 8, the Pacific; and Region 9, the Caribbean.

Even with extensive efforts to ensure a complete volumetric representation, in the test data on which reports are based, previous editions fell slightly short of that goal. With the assistance of the Defense Contract Management District (DCMD) field offices and the cooperation of our suppliers, however, the effort for the year 2001 resulted in a 100% representation of all fuels procured by DESC.

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PQIS.avi

The Source for Fuel Data



Section I – Introduction

Background

The Petroleum Quality Information System came into being out of a clearly established need for a comprehensive system to track fuel quality trends; conceptualized as the authoritative, single-source, data base, readily accessible to DoD Defense Energy Program members and affiliates. Consensus was formulated on evaluation of data collected from March – May 1988 in response to a request from the Office of the Assistant Secretary of Defense, Energy Policy Directorate, for review and comment on a focus report to the Services in February 1988. The 1987 report “Petroleum Quality Information System (PQIS): Architecture and Design Alternatives”, published by the Logistics Management Institute (LMI), outlined requirements and alternatives for a system to store and process information on the quality of petroleum products procured and used by the Department of Defense (DoD). General agreement resulted in the Defense Energy Program Policy Memorandum (DEPPM) 89-1, issued 25 April 1989, establishing the requirement for PQIS and designating responsibility for its design and maintenance to the Defense Fuel Supply Center, now the Defense Energy Support Center (DESC). PQIS was planned as an automated, mainframe, information management system that would standardize the disparate government and industry quality control and surveillance data reporting formats. Information in the database would be available to DoD personnel for use in identifying, investigating, or resolving fuel related problems.

The DEPPM 89-1 authorized LMI to develop a prototype to be tested and evaluated by the DESC. Review and acceptance of the archetype was attained by March 1989. However, the initial PQIS database system only processed data on procurements of aviation fuels (JP-4, JP-5 and JP-8), due to funding constraints and the complexity of designing an “all-encompassing” system. This prototype was put into operation in October 1990, operating on a desktop-PC platform, utilizing a DOS-based program, dBase IV®. The database has since been converted to MS-Access® format, through several iterations, but remains on a PC platform. Plans to locate this database on an Internet application, for worldwide use, are still being developed. There still needs to be resolved what Structured Query Language (SQL) engine is to be utilized, to be tied to a Web Portal capable of Pivot-Table driven, HTML Data Access and Whiteboard Pages, that will be compatible with the many systems it is to serve. Traditionally, test reports received from refiners worldwide had been manually entered into PQIS. Last year the Paperless Ordering and Receipt Transaction Screens (PORTS) software was utilized, for automated data entry. Anticipated improvements in efficiency, and ‘real-time’ datasets, are expected to assist in implementation of standardized data reporting criteria established in 1999. Due to problems with data submission via PORTS, and amplified verification process it necessitated, it has fallen somewhat short of expectations in the first year.

The first PQIS Report was published in June 1998, providing statistical information on data from calendar years 1990 to 1996, on aviation fuels only. The second and third were successively published, in 1997 and 1998, each covering supplementary information for the preceding year. The 1999 Report expanded on product coverage, to include reporting on Naval Distillate Fuels, or MOGAS; Marine Residual Fuel, Grade RME-25; and on Unleaded, Automotive Gasoline. Last year’s Report was emended, though, to eliminate reporting of test data no longer solicited, due to improvements in product testing or processing. This report ensues, utilizing the same formats for its Histograms and Tables, to facilitate comparison of information in the previous reports. It is reformatted slightly to accommodate the transmutation above, and to provide more accurate representations of interpreted data.

The PQIS database has evolved correspondingly over the years. Test results for calendar years 1990 to 1994 were archived, on issue of the initial report, and those starting from January 1995 were kept in the then active database. This database was eventually archived, too, at the end of complete data input of records through 1998; but remains online for referral, internally. Records



starting with test data for 1999 procurements are entered into the currently active database for processing and analysis. The system permits querying the preceding database, however, so that historical data remains accessible. Requests for this type of information or analysis, however, should be submitted with a sufficient allowance of time to develop adequate queries and/or the linking of database tables.

In review of the data presented herein, it needs to be noted that contract delivery periods often extend past calendar year ending dates. Fuel from contracts let in 1999, for example, may be delivered in fiscal year 2000. To assess supplier compliance, in **Table 2** of this report, data is grouped by fiscal year of the contract, through year 1998. In 1999, better shipment tracking allowed calendar year representation, as with tables and histograms.

Lab ID No	Report Date	Fuel	Flash
JP819990078	04-Jan-99	JP8	50
JP819990079	02-Feb-99	JP8	56
JP819990080	11-Feb-99	JP8	49
JP819990081	21-Feb-99	JP8	53
JP819990082	02-Mar-99	JP8	46
JP819990083	16-Mar-99	JP8	46
JP819990084	30-Mar-99	JP8	46
JP819990085	07-Apr-99	JP8	43
JP819990086	24-Apr-99	JP8	44
JP819991511	09-Jul-99	JP8	46
JP819991512	01-Aug-99	JP8	52
JP819991513	08-Aug-99	JP8	49
JP819991514	02-Sep-99	JP8	47
JP819991521	14-Sep-99	JP8	48
JP819991515	14-Oct-99	JP8	47
JP819991307	04-Nov-99	JP8	50
JP819991310	21-Dec-99	JP8	49

PQIS Data Entry screens

Current PQIS database highlights:

- Contracts increased to 310
- F-76 data is expanded further, representing 452 batches of Marine diesel
- MOGAS data is supplemented, to cover 36.5 million gallons of MOGAS
- Fuel shipments represented in PQIS total 4.3 billion USG for 2001, categorized by mode as follows:

Mode:	Tanker	Barge	Pipeline	Tank Truck
2001 Volume (Million USG):	1,373.5	452.6	2,077.9	382.5
2001 Issue/Shippments:	169	295	1328	7580



Terminology

For the purposes of this report, the following definitions apply:

Spectender: A complete specification analysis report of product being offered for acceptance by the US Government. For fuels, it is the written report of results for full specification testing, in the refinery or terminal shipping tank, of product offered for acceptance.

Report: Represents one spectender tank test result (Complete Specification Test Results), regardless of how many shipments were made from the tank or if more than one tank is involved in a total loading or product movement.

Volume: Total volume, expressed in millions of gallons, delivered to the US Government or other designee, from the shipping tank referenced in the report.

Region: The grouping of states or countries into defined geographical areas affording a more specific or focused data analysis for a particular area of interest. It is based on the US Department of Energy designated Petroleum Administration for Defense Districts (PADDs), cited here to provide a standard industry reference for comparative study. These do not correlate with the Defense Fuel Regions or Offices. Since shipments can originate and terminate in different Regions, the determination of the Region is based on the refinery location rather than the receipt location.

Region	Title	PADDs	States or Countries
1	East Coast	I	ME, VT, NH, MA, RI, CT, NY, PA, NJ, DE, MD, VA, WV, NC, SC, GA, FL
2	East Central	II	ND, SD, MN, IA, NE, WI, MI, OH, KY, TN, IN, IL, MO, KS, OK
3	Gulf Coast	III	AL, MS, AR, LA, TX, NM
4	West Central	IV	MT, ID, WY, UT, CO
5	West Coast	V	WA, OR, CA, NV, AZ
6	Middle East		Kuwait, Bahrain
7	European		Europe, Israel, Turkey
8	Pacific		Korea, Japan, HI, AK, Australia
9	Caribbean		Coastal Aruba

Average: The average calculated on volume of fuel purchased or each instance of purchase. For example, if one batch of product had an API Gravity of 46.0 with 1,000,000 gallons delivered and another batch had an API Gravity of 43.5 with 500,000 delivered, the average, based on occurrences of test values, would be:

$$(46.0 + 43.5)/2 = 44.75.$$

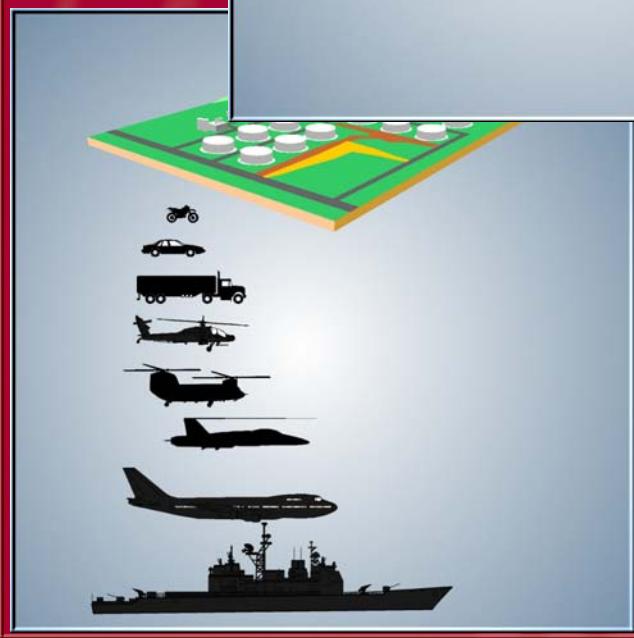
The volumetrically weighted average, based on volumes of product represented by the test values, would be:

$$(46.0 \times 1,000,000) + (43.5 \times 500,000) / 1,500,000 = (67,750,000 / 1,500,000) = 45.17$$

The difference between the two averaging methods is 0.42 °API. Each method uses a different basis to calculate the average. Both averages are provided in this report.



From fossil... To power



D
E
S
C



Product Distribution

Data in the PQIS database for 2001 represents over 4.3 billion gallons of fuel. Table 1 shows the volumes and number of shipping tank reports, presented by product, for the past five years.

Table 1. Total Fuel Database Entries.

Fuel	1997		1998		1999		2000		2001		Total	
	Volume	Entries	Volume	Entries	Volume	Entries	Volume	Entries	Volume	Entries	Volume	Entries
AN8	3.20	3	3.39	1	3.92	1	5.38	1	—	—	15.89	6
F76	—	—	—	—	580.58	119	645.85	121	673.53	175	1,899.96	415
JP4	1.64	9	1.71	10	1.22	80	1.13	84	1.55	121	7.25	304
JP5	707.32	252	615.81	230	664.68	307	687.94	475	836.34	437	3,512.09	1,701
JP8	2142.56	1695	2228.68	1952	2,569.64	7157	2,535.49	7142	2,743.22	8624	12,219.59	26,570
MU	—	—	—	—	15.00	16	28.43	16	16.52	13	59.95	45
RME	—	—	—	—	10.34	2	10.85	2	15.33	2	36.52	6

[Volume in Millions of Gallons]

The report data in Table 1 indicates the number of database entries for each, individual shipping tank used to sell product to the DESC, irrespective of the contractor. A single product movement may involve more than one shipping tank/vessel; just as many product movements (e.g. truck shipments) could have the same source tank. The quantities cited represent the actual quantity shipped to the US Government from a particular shipping tank at a refinery or terminal, not total quantity in the tank at the time of sampling. The quantity reported on a test report from each shipping tank is the basis for calculating volumetrically weighted averages (see [Terminology](#)) for a specification property.

There is no reporting on aviation fuel for use in the Antarctic, product code “AN8”, since there were no significant procurements in 2001. Still included in Table 1, for this report, is continued reporting on Naval Distillate Fuels (DFM/F76); Marine Residual Fuel, Grade RME-25 (IFO 180); and Unleaded, Automotive Gasoline. Since these product procurements are comparatively small, they are omitted from the analysis and the Histograms in Section II and from those tables where there is yet insufficient information in the database to warrant their inclusion. Study of JP4 and MOGAS is also omitted from Section II. For some select test properties, however, the minimum, average, volumetrically weighted average, and maximum values are included for JP4.

[Table 2](#) shows the representative volume of product recorded in PQIS versus the amount actually purchased per the Defense Fuel Automated Management System (DFAMS). In DFAMS, contracts are grouped according to the fiscal year in which awarded, with each contract number containing a segment that indicates that fiscal year. This dictates this fiscal grouping, in lieu of calendar, as the basis for comparison. Modifications to the PQIS database in 1999, in tracking shipments, effected volume reporting being based on a calendar year instead of fiscal, conversely. This has resulted in some overlap in volume totals, in the past, since orders could be made in December and delivered in January, causing delivery period groupings to extend across calendar years. The DFAMS printout for each Contract Line Item was compared, order by order, to quantities in the PQIS database, however, so that any possible discrepancy was only marginally significant. Due to improvements in the efficiency of reporting in 2001, however, PQIS reflects DFAMS records exactly, for all fuels. The fuel volumes in the table represent information on fuels on a worldwide basis, for the last five years.



Table 2. Volumes Purchased vs. Volumes Reported.

AN8	1997	1998	1999	2000	2001
Purchased	—	—	3.9	5.4	—
Reported	—	—	3.9	5.4	—
Difference	—	—	0.0	0.0	—
Percentage	—	—	100%	100%	—
F76	1997	1998	1999	2000	2001
Purchased	—	—	570.2	648.5	673.5
Reported	—	—	570.2	648.5	673.5
Difference	—	—	0.0	0.0	0.0
Percentage	—	—	100%	100%	100%
JP4	1997	1998	1999	2000	2001
Purchased	1.5	0.8	1.2	1.1	1.6
Reported	1.5	0.8	1.2	1.1	1.6
Difference	0.0	0.0	0.0	0.0	0.0
Percentage	100%	100%	100%	100%	100%
JP5	1997	1998	1999	2000	2001
Purchased	702.7	393.1	664.3	676.6	836.3
Reported	696.3	338.0	664.3	676.6	836.3
Difference	6.4	55.1	0.0	0.0	0.0
Percentage	99%	86%	100%	100%	100%
JP8	1997	1998	1999	2000	2001
Purchased	2577.0	1277.5	2690.5	2,631.6	2,743.2
Reported	2309.6	1155.9	2564.0	2,513.9	2,743.2
Difference	267.4	121.6	126.5	117.7	0.0
Percentage	90%	90%	95%	96%	100%
MU	1997	1998	1999	2000	2001
Purchased	—	—	15.0	28.4	16.5
Reported	—	—	15.0	28.4	16.5
Difference	—	—	0.0	0.0	0.0
Percentage	—	—	100%	100%	100%
RME	1997	1998	1999	2000	2001
Purchased	—	—	10.34	10.9	15.3
Reported	—	—	10.34	10.9	15.3
Difference	—	—	0.0	0.0	0.0
Percentage	—	—	100%	100%	100%

[Volume in Millions of Gallons]



Summary by Region

The next three Tables provide a breakdown of the total number of reports received per Region, and a breakdown of both the number of reports and volume received for each product category. Table 3 indicates the total number of fuel test reports received, by year, from each region, as an aid to the reader in evaluating data presented in this report. Clause E40.05, Material Inspection and Receiving Report, cited in DESC contracts, requires fuel contractors to submit a copy of the complete laboratory test report from each shipping tank used for shipments to DESC Customers.

Table 3. Total Reports Received by Year and Region.

Year	PQIS Region									Totals
	1	2	3	4	5	6	7	8	9	
1999	138	314	1124	198	279	12	212	309	13	2893
2000	143	400	1023	225	337	25	127	258	22	0
2001	73	504	1050	225	439	36	184	362	20	0

The values above represent the number of possible data points available for each Region, for all fuel received for the specific year that was entered into the PQIS database. Again, note that the number of occurrences does not necessarily relate directly to the number of shipments made, since one batch from a particular refinery tank may have been used in multiple shipments, on different orders. Again, this year Regions 2 through 5 and 8 submitted the largest number of reports. Reporting has increased for all areas, except Regions 1 and 9, compared to last year, with Region 4 holding constant. The downturn for the East Coast and the Caribbean is more indicative of a decrease in procurements than of production. Procurement from the East Coast Region are significantly down, and the Caribbean, customarily lagging in volume, has decreased by two million gallons. Region 3, which includes Texas, still leads in the submission of reports, which is commensurate with total procurements.

Table 4 provides information on the number of reports received per calendar year, by Region, for each type of fuel reported, representing a more detailed breakdown of Table 3. It can be used in conjunction with the data in Table 5 for an indication of the average parcel size, which might be indicative of the modes of transportation used. For example, for JP5 in 1999, Region 6 reported twelve tenders that represent 62.01 million gallons; which means that each tender corresponds to over 5.1 million gallons, or the parcel size of a tanker. The single shipment of 0.53 million gallons of motor gasoline from Region 7 in 2000 would suggest mainly truck shipments, probably mixed with some pipeline transport, during this period.

Table 5 represents the volumes of fuels, in millions of gallons, received each calendar year in the individual Regions, that was sold to DoD customers. The increase in JP4 does not, necessarily, reflect a reversal of the previous trend of a decrease in the volume of JP4 delivered. It is more likely an increase in overall consumption rather than a shift from customers converting from JP4 to JP8. Fuel procured in 2001 but not lifted until 2002 accounts for the absence of reporting on the DoD customized AN8 formulation. Although outside the scope of this report, it is possible to further break down volumes received; categorized by the state in which the refinery is located, by company name, by refinery location, or by contract, for example. Organizations with a particular interest may contact DESC-BP, to submit a request for such custom reports and charting.



Table 4. Annual Reports Received – By Region

Year	Fuel	PQIS Region									Total
		1	2	3	4	5	6	7	8	9	
1999	AN8	—	—	—	—	—	—	1	—	—	1
	F76	—	—	47	—	25	—	13	44	1	130
	JP4	—	—	—	—	—	—	—	8	—	8
	JP5	—	35	117	—	53	12	14	10	2	243
	JP8	138	279	959	198	201	—	183	232	10	2200
	MU	—	—	1	—	—	—	1	13	—	15
	RME	—	—	—	—	—	—	—	2	—	2
2000	AN8	—	—	—	—	—	—	1	—	—	1
	F76	6	—	36	—	31	14	26	29	6	148
	JP4	—	—	—	—	—	—	—	12	—	12
	JP5	—	46	116	—	103	11	18	12	—	306
	JP8	137	354	868	225	203	—	81	191	16	2075
	MU	—	—	3	—	—	—	1	12	—	16
	RME	—	—	—	—	—	—	—	2	—	2
2001	AN8	—	—	—	—	—	—	—	—	—	0
	F76	2	—	37	—	39	22	20	43	6	169
	JP4	—	—	—	—	—	—	—	7	—	7
	JP5	—	44	125	—	118	12	23	35	1	358
	JP8	71	460	887	225	282	—	140	264	13	2342
	MU	—	—	1	—	—	—	1	11	—	13
	RME	—	—	—	—	—	2	—	2	—	4

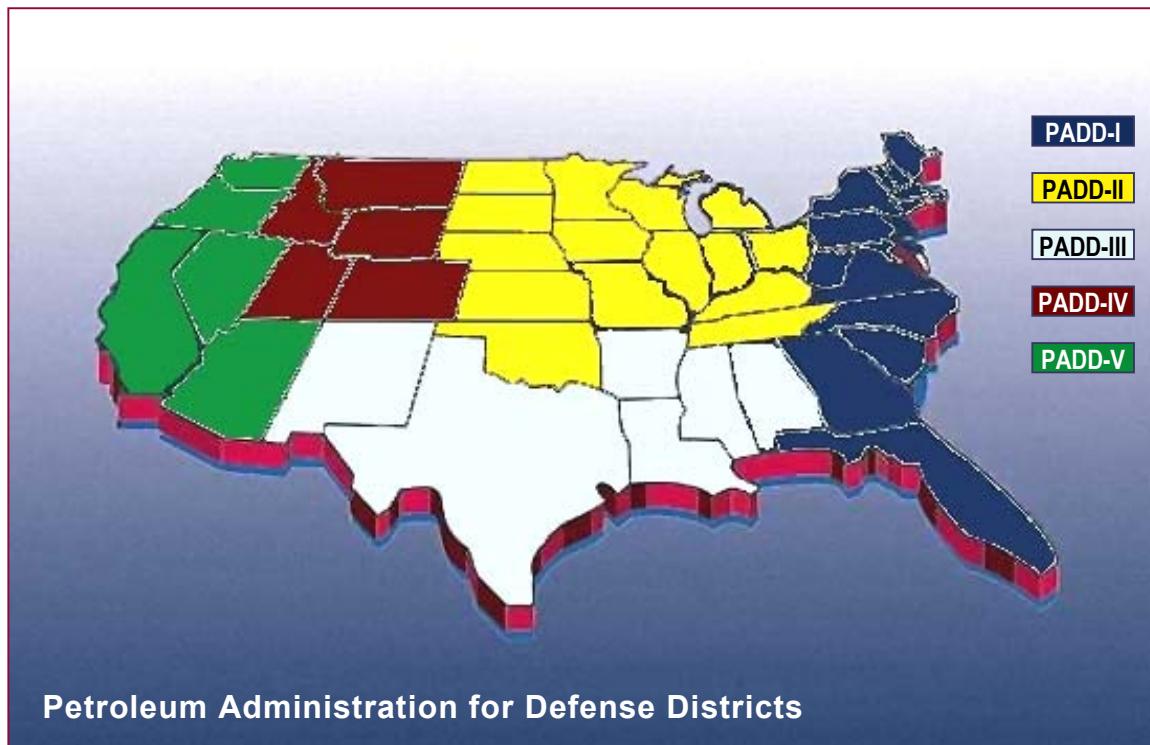
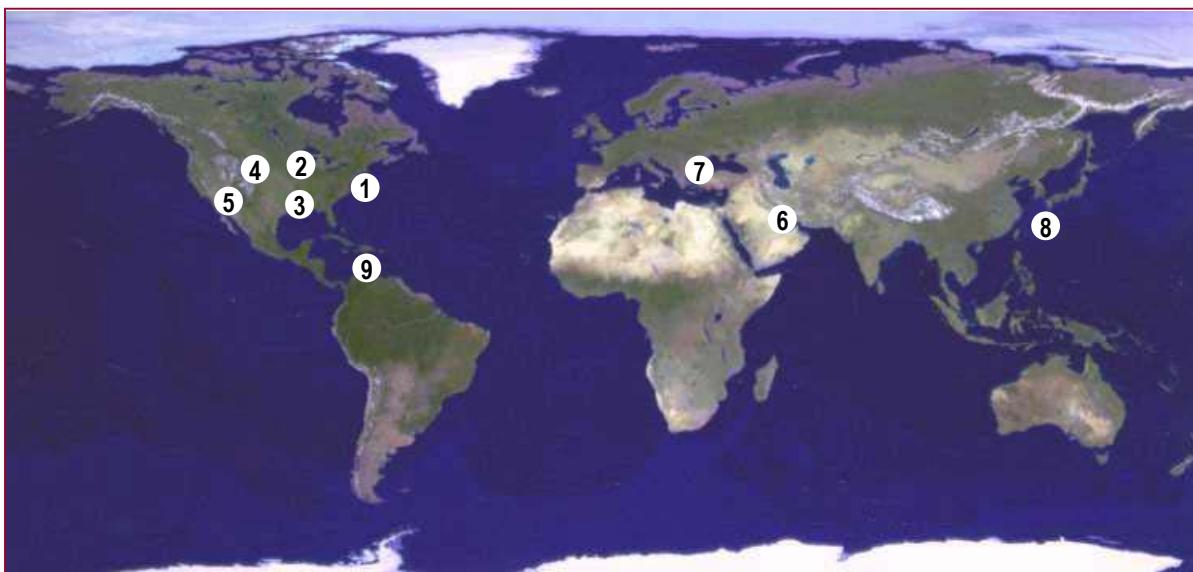




Table 5. Annual Volume of Fuel Received – By Region.

Year	Fuel	PQIS Region									Totals
		1	2	3	4	5	6	7	8	9	
1999	AN8	—	—	—	—	—	—	3.92	—	—	3.92
	F76	—	—	173.9	—	96.29	—	50.03	250.53	9.80	580.55
	JP4	—	—	—	—	—	—	—	1.22	—	1.22
	JP5	—	6.27	307.56	—	168.06	62.01	54.28	46.87	19.63	664.68
	JP8	104.17	207.91	1,024.91	92.40	308.38	—	463.48	302.42	65.97	2,569.64
	MU	—	—	0.38	—	—	—	0.29	14.33	—	15
	RME	—	—	—	—	—	—	—	10.34	—	10.34
2000	AN8	—	—	—	—	—	—	5.38	—	—	5.38
	F76	12.29	—	146.62	—	138.98	88.46	115.09	120.31	33.10	654.85
	JP4	—	—	—	—	—	—	—	1.13	—	1.13
	JP5	—	8.00	308.81	—	191.57	60.88	57.27	61.41	—	687.94
	JP8	108.86	249.55	1,041.35	101.82	371.57	—	177.46	362.74	122.11	2,535.46
	MU	—	—	11.81	—	—	—	0.53	16.09	—	28.43
	RME	—	—	—	—	—	—	—	10.85	—	10.85
2001	AN8	—	—	—	—	—	—	—	—	—	0
	F76	4.12	—	114.69	—	109.17	147.49	92.83	157.47	43.75	669.52
	JP4	—	—	—	—	—	—	—	1.55	—	1.55
	JP5	—	7.52	327.42	—	196.44	59.29	86.91	160.94	9.83	848.35
	JP8	38.36	313.10	1,074.10	105.52	443.25	—	366.65	331.57	83.58	2,756.13
	MU	—	—	0.42	—	—	—	0.87	15.22	—	16.51
	RME	—	—	—	—	—	9.87	—	5.46	—	15.33

[Volume in Millions of Gallons]



Region 1 – East Coast (PADDs-I)
Region 2 – East Central (PADDs-II)
Region 3 – Gulf Coast (PADDs-III)

Region 4 – West Central (PADDs-IV)
Region 5 – West Coast (PADDs-V)
Region 6 – Middle East

Region 7 – European
Region 8 – Pacific
Region 9 – Caribbean



The Data presented in this report has been carefully evaluated for accuracy and completeness, exploiting the entire resources of PQIS. As an adjunctive tool to this report, a CD with additional data is available to users of this report. Included are abridged copies of PQIS databases that have been stripped of sensitive material. It should be noted that results in our analyses may have been affected by that data, and that yours could produce slightly different results, as such.



Although every effort at complete accountability has been made in collecting, analyzing, and presenting the data in this report, it should be noted there are instances where laboratories or suppliers failed to report individual test results or characteristics on (particular consignments of) fuels. Reasons may range from inapplicability, because of processing or test methods employed, to the requirement being exempted, in particular contracts or purchase orders. Whereas every effort has been made to garner this data, to present coherent analyses, this has not always been attainable. Consequently, certain statistics presented herein are weighted, adjusted to representative values.

So too for “shortages” from an overlap in volume totals, when allotment delivery periods extend across calendar years; as discussed in the Table 2 paragraph under [Product Distribution](#). All charts and tables, however, specify the volume of fuel and the number of reports on which the fuel characteristic was assayed. These may be contrasted against totals reported in [Table 4](#) and [Table 5](#), to establish possible deviation. For analyses predicated on ‘occurrence averages’, where volumetric totals are not commensurate, proportionating adjustments may be applied.



Section II – Product Specifications

The DoD Specification for procurement of JP4 and JP5 is currently MIL-DTL-5624T, Turbine Fuel, Aviation, Grades JP-4, JP-5, and JP-5/JP-8 ST, dated 18 September 1998. The specification for JP8 is MIL-DTL-83133E, Turbine Fuels, Aviation, Kerosene Types, NATO F-34 (JP-8), NATO F-35, and JP-8+100, dated 1 April 1999. MIL-F-16884J, Fuel, Naval Distillate, is used for marine fuel. These specifications govern the compositions of these fuels, procured for the DoD.

For the purposes of this report, only those specification properties that have measurable and definitive requirements in the specification are summarized, with the exception of the “reported” cetane index and the naphthalene content (not required for JP5). Specification properties that involve an assigned rating (e.g., water reaction, and copper corrosion) are not summarized; but data for those specification properties not reported is available by request, from DESC-BP.

Not all tests need to be performed on all batches. For the Net Heat of Combustion requirement, contractors have a choice of two or three different methods/units of measurement for reporting, depending on the product. Contractors also have the option of not performing Mercaptan Sulfur testing, when opting for the Doctor Test. If the Doctor Test is negative, Mercaptan Sulfur testing need not be performed; but some contractors elect to report both the Doctor Test and Mercaptan Sulfur results. Further, if the Smoke Point is below 25 mm, the product is acceptable as long as the Naphthalenes Content is below 3.0% and the Smoke Point above the minimum of 19 mm. Therefore, the number of reports represented by the data may be different for individual test parameters. Specification limits are provided on all Histograms and with Tables.

Fuel Characteristics - Global

As it has been since its introduction to this Report in 1999, 2001 shipments of motor gasoline (MUM/MUR) remain comparatively low. For this reason, and the fact that its characteristics and specification differ from those for turbine fuels, it is reported separately here; and in less detail. Although improved over last years reporting, there are still insufficient data points to provide proper statistical analysis. As such, histograms are not used; rather the data is presented in a single table. Noting the volume of fuel and number of shipments in [Table 6](#), be cognizant that cited information is representative only. With an improved reporting, however, it will probably usurp JP-4 reporting in future issues of this report.



As with gasoline, there is insufficient JP-4 data recorded in PQIS to provide useful histograms; but there is enough specific data to have warranted inclusion in the [Tables](#) for most, in last years report. With declining use, though, usefulness of this data is questionable. While the formulation of JP-4 is closer to that of gasoline, it is combined with the turbine fuels since testing, additives, and end use are more akin to them. However, note that there are instances where there is no analogous table, where that characteristic is inapplicable or not reported for JP-4. The same is true of Naval Distillate Fuel.

Histograms depicting diesel fuel product characteristic variances follow. Histograms show the measure of each test property result reported for 2000, for all Regions combined, providing an overview of the condition of fuel delivered to DESC customers. These are augmented by detailed data, presented by region, in the [Tables](#).



Table 6. Motor Gasoline (Midrange & Regular) Characteristics – 2001.

Characteristic	PQIS Reporting							
	Fuel	Region	Volume	Min	Avg	Wt Avg	Max	Count
Anti-Oxidants (mg/L)	MUM	3	0.42	17.10	17.10	17.10	17.10	1
	MUM	7	0.87	15.90	15.90	15.90	15.90	1
	MUM	8	15.22	5.30	13.42	12.55	15.90	10
API Gravity (@ 60°F)	MUM	3	0.42	57.90	57.90	57.90	57.90	1
	MUM	7	0.87	57.50	57.50	57.50	57.50	1
	MUM	8	15.22	48.40	52.53	52.63	57.20	11
Distillation 10% Recovered (°C)	MUM	3	0.42	57.80	57.80	57.80	57.80	1
	MUM	7	0.87	33.80	33.80	33.80	33.80	1
	MUM	8	15.22	55.00	57.71	57.70	63.50	11
Final Boiling Point (°C)	MUM	3	0.42	222.20	222.20	222.20	222.20	1
	MUM	7	0.87	204.00	204.00	204.00	204.00	1
	MUM	8	15.22	181.00	190.55	190.44	208.00	11
Lead (g/L)	MUM	3	0.42	0.01	0.01	0.01	0.01	1
	MUM	7	0.87	0.10	0.10	0.10	0.10	1
	MUM	8	15.22	0.00	0.00	0.00	0.01	11
AKI (Octane)	MUM	3	0.42	84.70	84.70	84.70	84.70	1
	MUM	7	0.87	87.00	87.00	87.00	87.00	1
	MUM	8	15.22	89.25	90.56	90.45	92.35	11
Total Sulfur (% mass)	MUM	3	0.42	0.01	0.01	0.01	0.01	1
	MUM	7	0.87	0.02	0.02	0.02	0.02	1
	MUM	8	15.22	0.00	0.00	0.00	0.01	11
Vapor Liquid Ratio (@ 0.1°C)	MUM	3	0.42	63.70	63.70	63.70	63.70	1
	MUM	7	0.87	61.50	61.50	61.50	61.50	1
	MUM	8	15.22	62.50	65.66	65.54	70.00	11

[(NR) = Not Recorded] ☐ [Volume in Millions of Gallons]

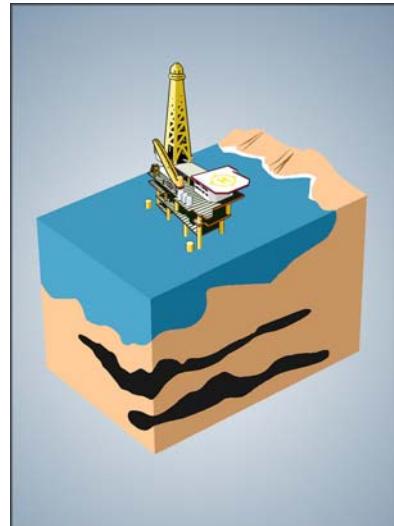


Histograms show, for each product and fuel characteristic, the percent by volume of product refined for delivery to DESC customers worldwide, for 2001. The grades of fuel and specification values are indicated in the text box within the chart with the mean and standard deviation values calculated for the Histogram. Percentages above the bars represent the percent of total volume of product falling within the data ranges indicated on the x-axis. Heavy dashed lines in the graph depict specification values. To ensure that all data is included, the first and last bars have an allowance for data outside of the ranges upon which the histogram is based, where appropriate. A “<[low value]” indicates all occurrences of volumes less than lower range [low value] and a “[high value]+” indicates all occurrences of volumes greater than the upper range [high value].

Values are grouped into data ranges indicated in the x-axis. The range includes data at the lower limit and up to, but not including, the upper limit. Consequently, values in the next data grouping above the specification limit, indicated by the dashed line, might include data that matches the upper specification limit. Consult the pertinent table, following the Histograms, to ascertain the maximum value for the property, to determine whether any volume purchased exceeded the specification limits.

The data indicates the overall distribution of test results on a worldwide basis for 2001. No attempt was made to separate results by the test method used, where more than one method was possibly utilized, although this also can be provided on specific request. Whereas the histograms are exemplificative, in that they may not represent 100 percent of the given fuel characteristic (see [The Data](#)), they illustrate sufficient data points to provide a quite accurate picture. It should be noted, however, that they are based on “occurrence averages”(i.e. plotting on submitted data for the characteristic). The quantities represented may be contrasted against totals in [Table 5](#), to determine any possible deviation.

The software used to prepare the Histograms is changed for this Report. It was determined that the previous program provided percentages of the number of occurrences within each range, as opposed to as a percentage of the overall volume of fuel being examined. Whereas one follows sufficiently close to the other to provide results that are only a slight deviation, the new software calculates and plots the data more precisely as described above. One other change in this year's report is the addition of charting for Marine sulfur content in [Histogram 5](#). It has been added to provide an overview of this currently topical statistic, as the world looks at controlling emissions.

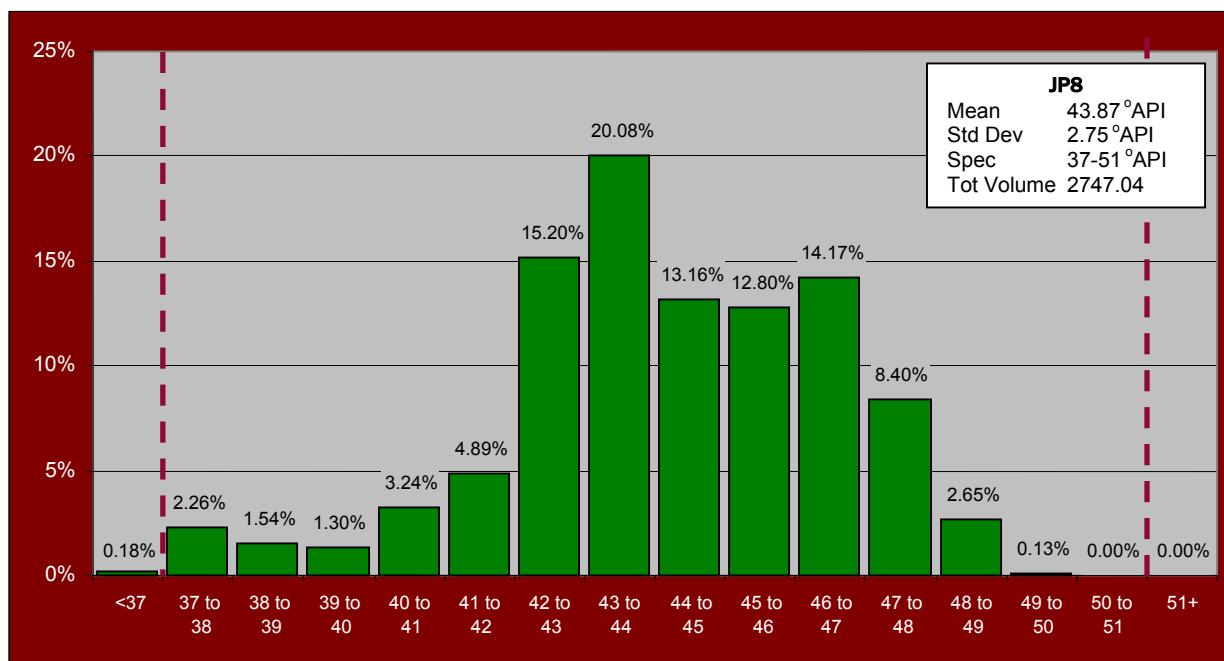
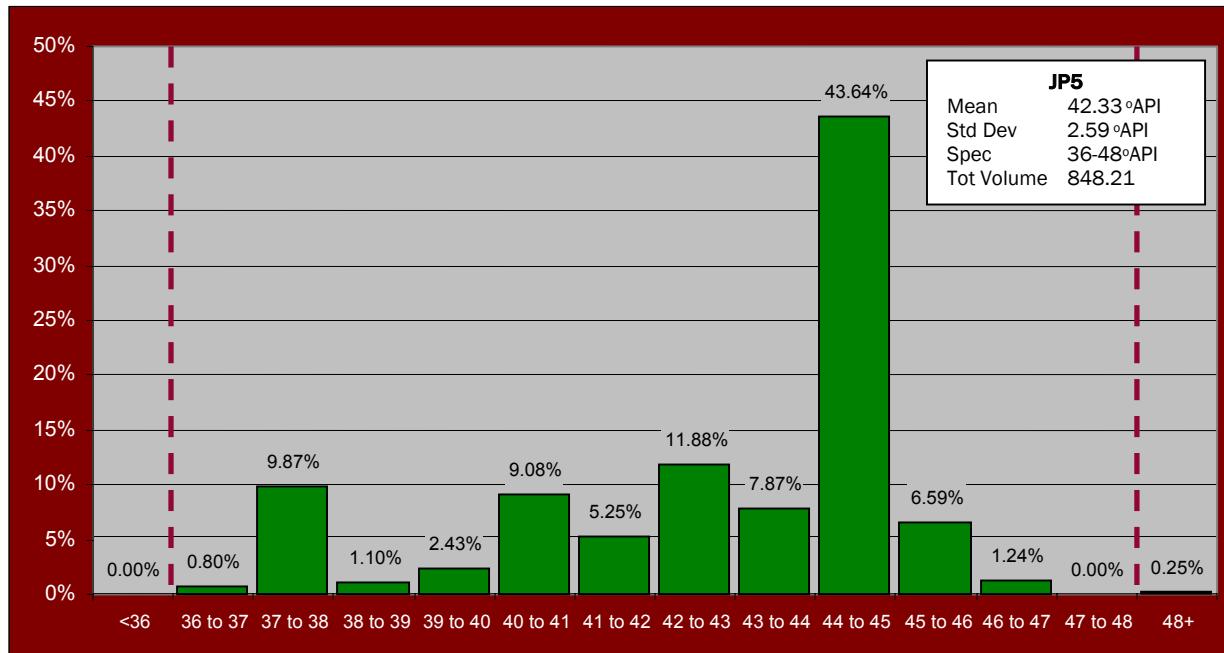


Despite the above, in comparing the Histograms for 2001 with those for 2000, only changes in distributions, the volumes of fuel processed, and values of the peaks reported are observed. No significant changes are observed in either the mean or the shape of the curve, for either JP5 or JP8 for each of the characteristics depicted.

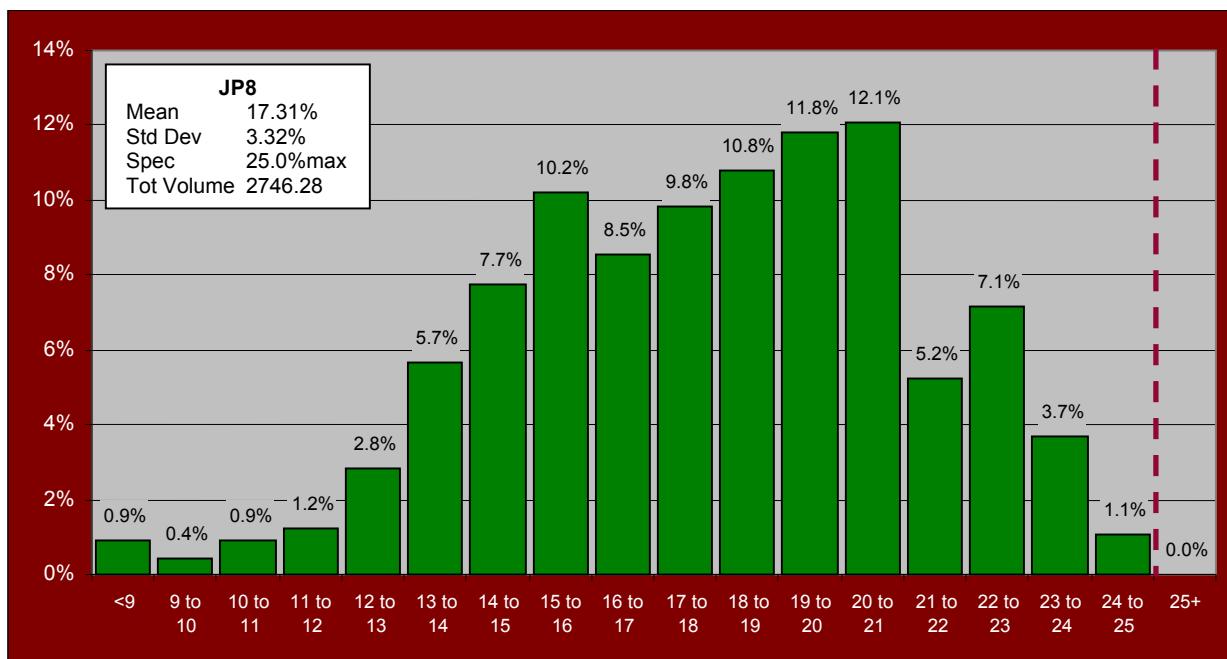
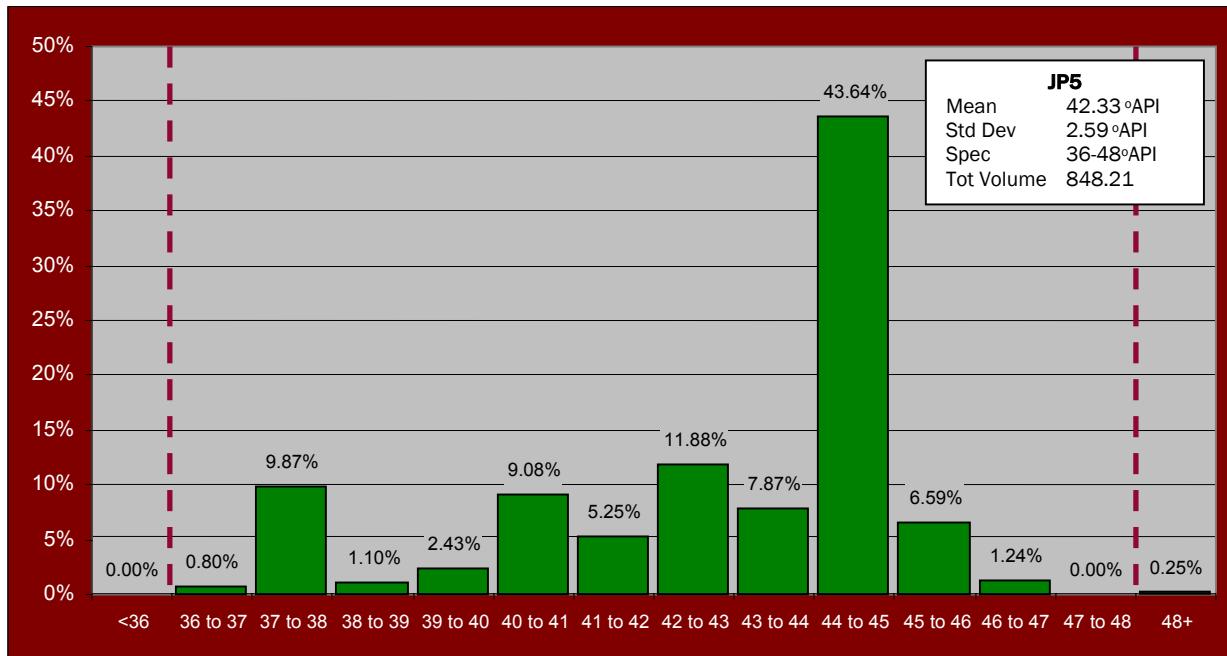
Histograms show that greater than 99% of the volume of fuel received in 2001 met specification properties. The most notable exceptions are Olefins in JP-5 and, again, the Total Acid Number in JP-8. Note that the Olefin maximum was removed from the governing specification in 1999. For the latter, the trend noted last year continues. DESC will continue to monitor these properties in JP8 shipments through 2002.



Histogram 1. API Gravity in Volume Received – 2001.



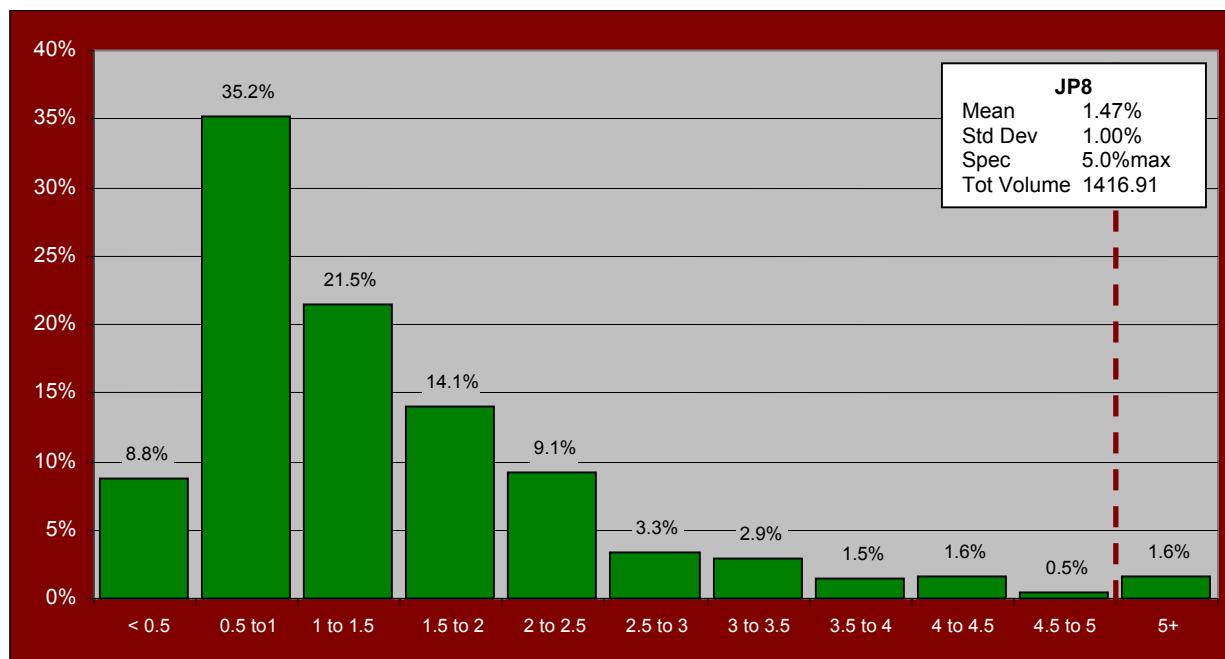
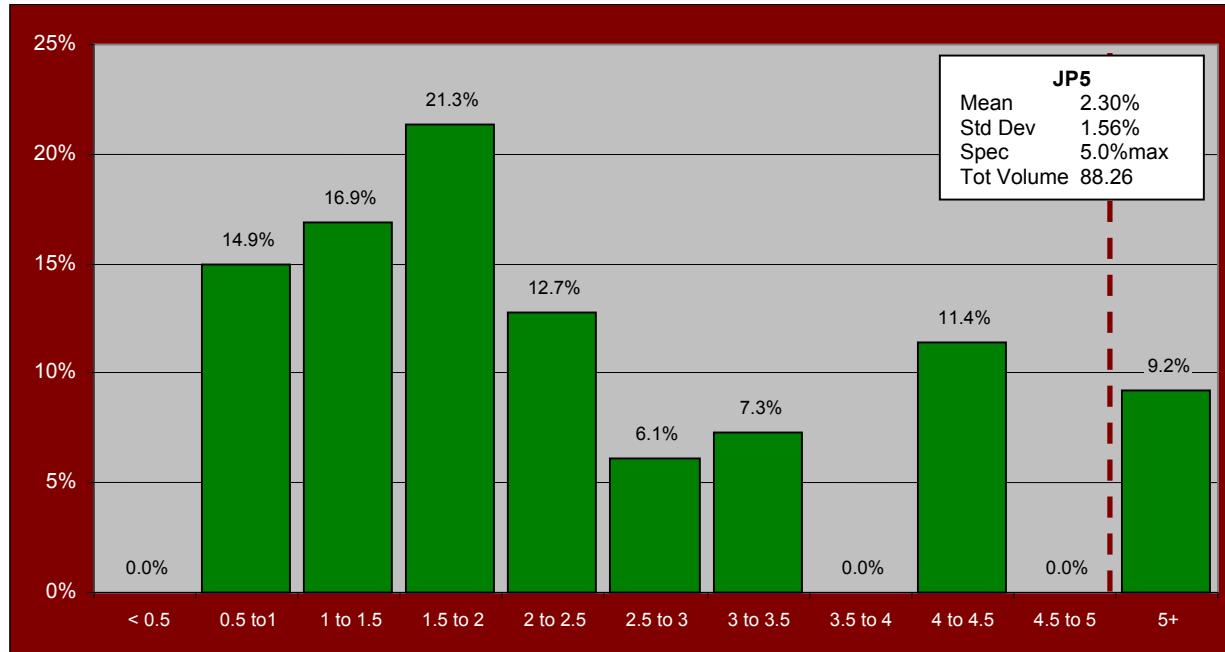
[Volume in Millions of Gallons]

Histogram 2. Aromatics in Volume Received – 2001.

[Volume in Millions of Gallons]



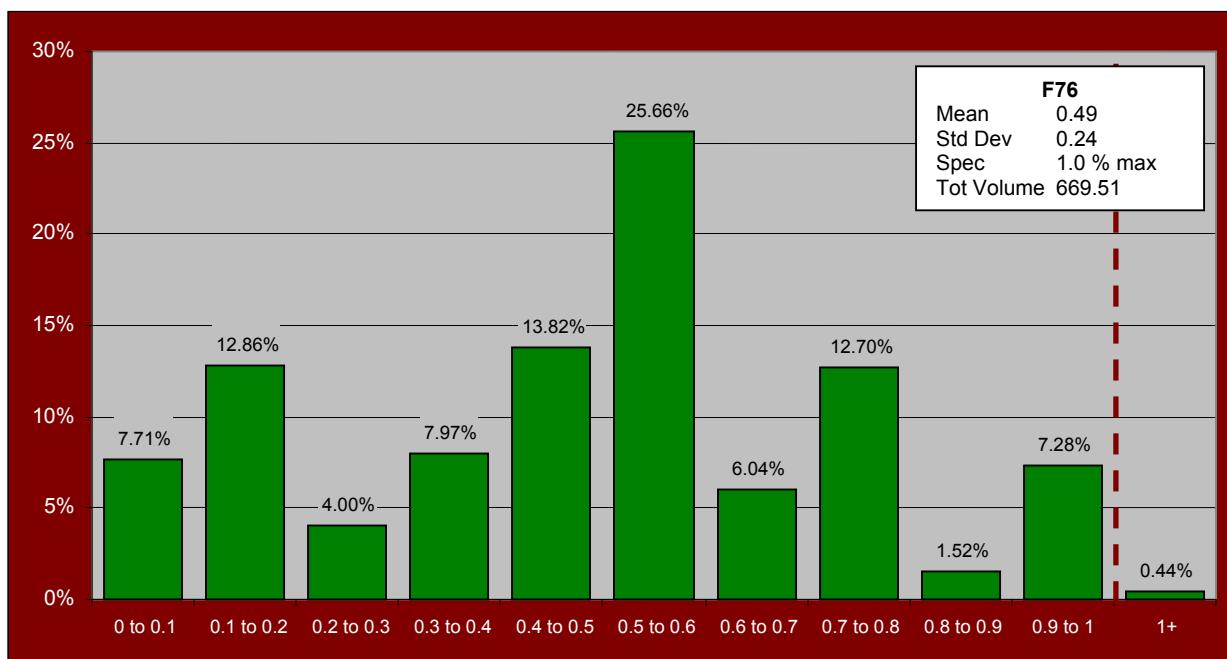
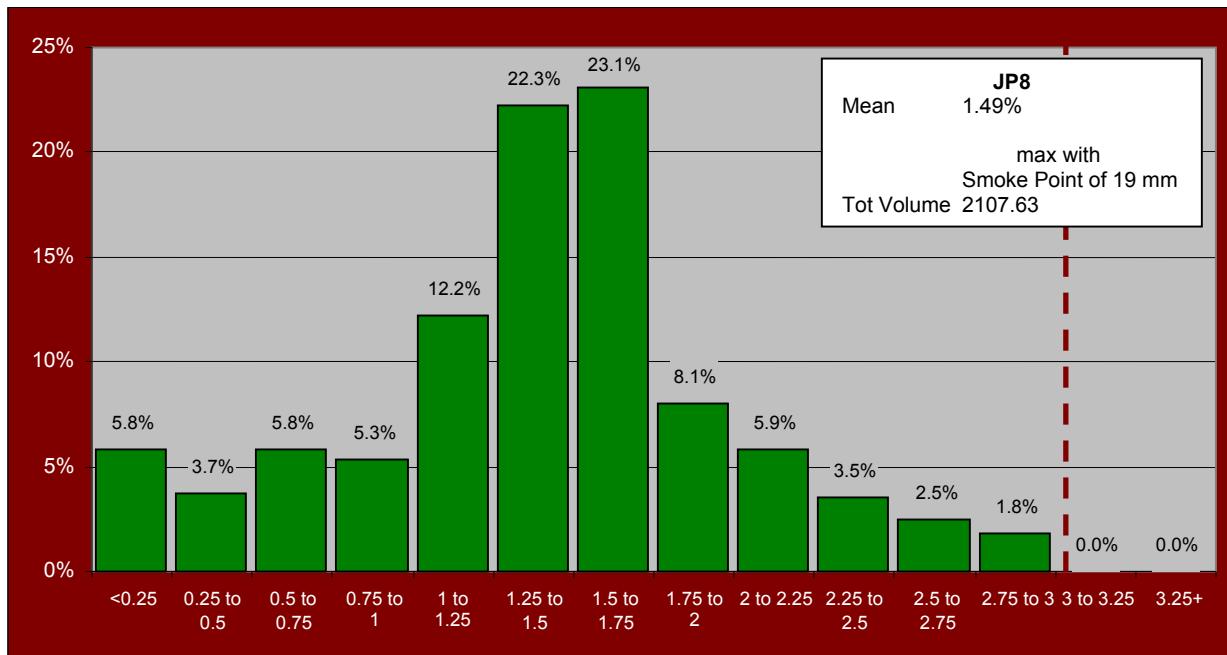
Histogram 3. Olefins in Volume Received – 2001.



[Volume in Millions of Gallons]



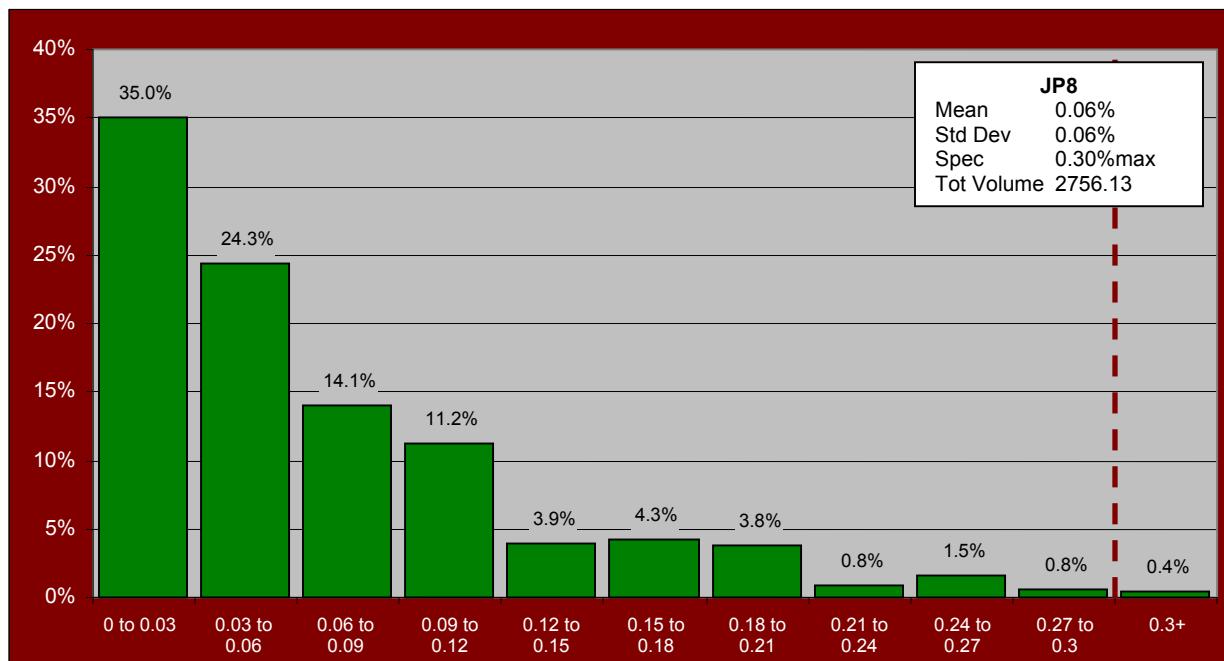
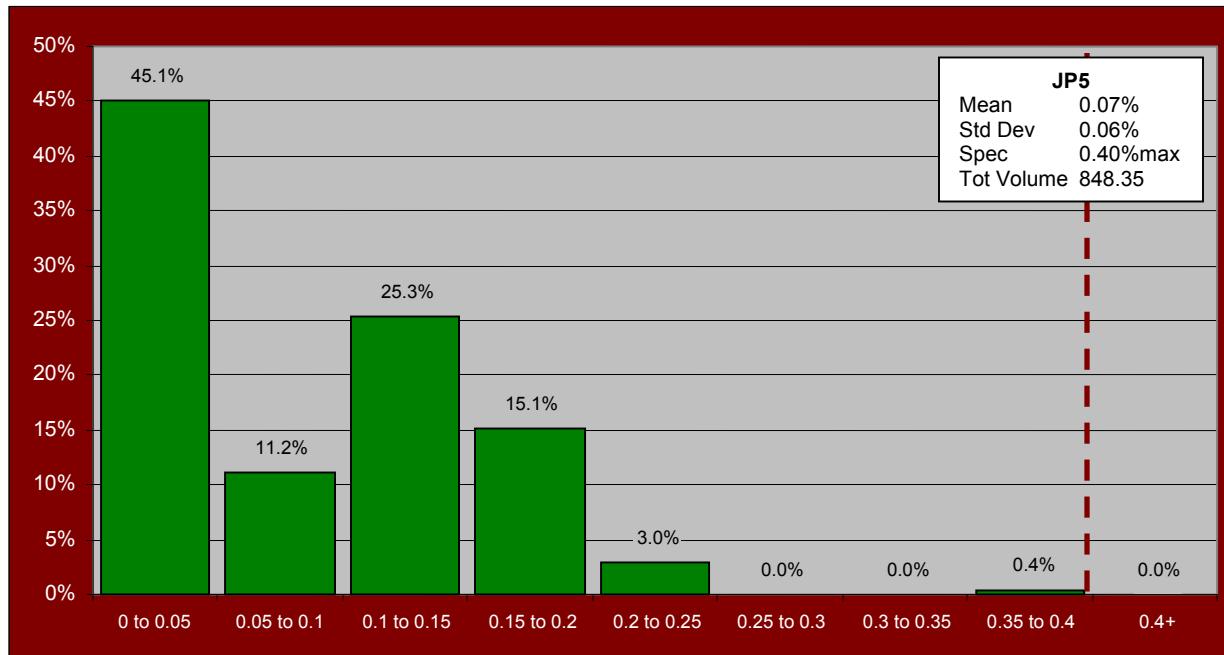
Histogram 4. Naphthalene in Volume Received – 2001.



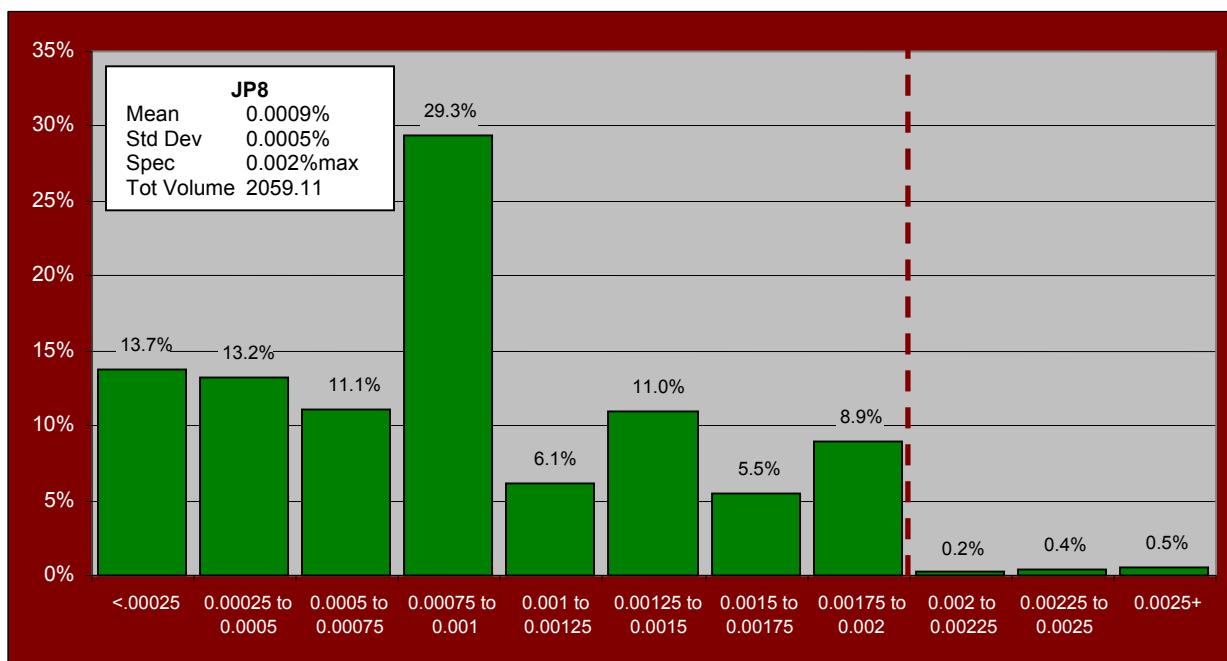
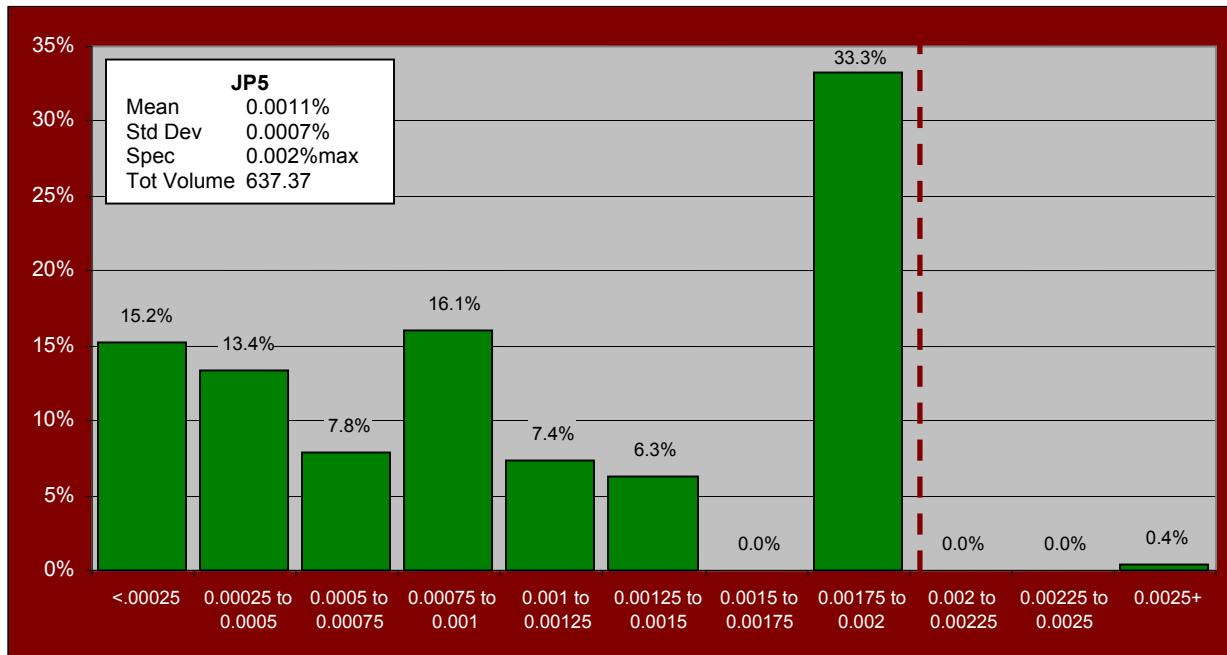
[Volume in Millions of Gallons]



Histogram 5. Total Sulfur in Volume Received – 2001.



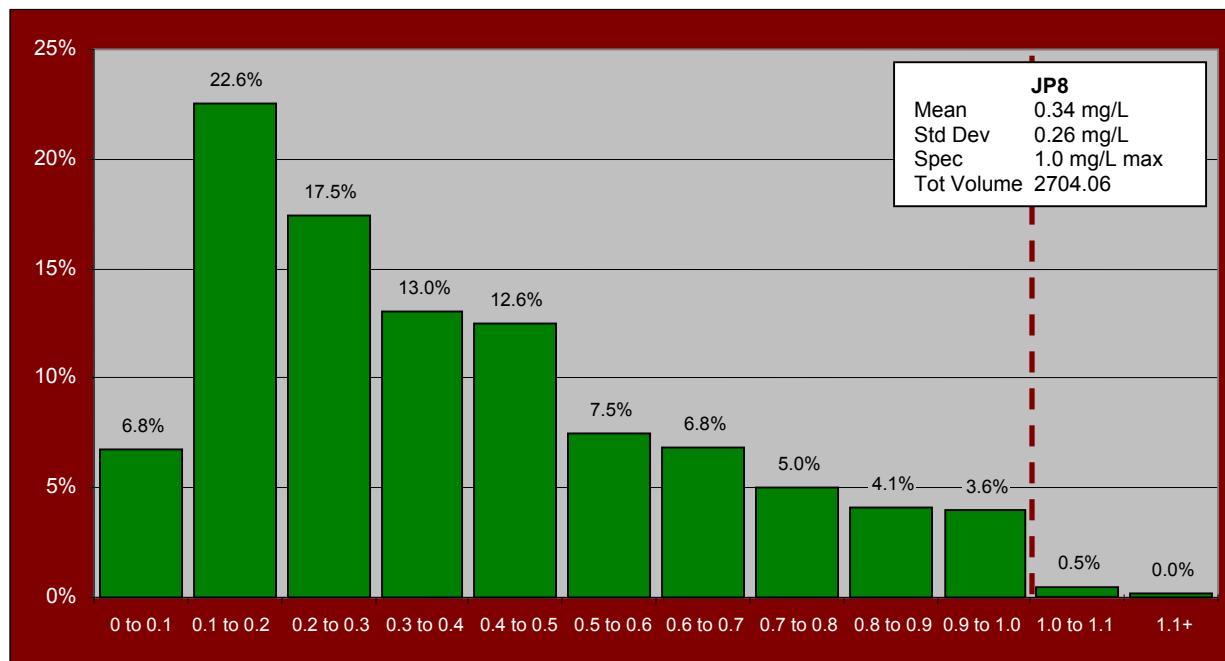
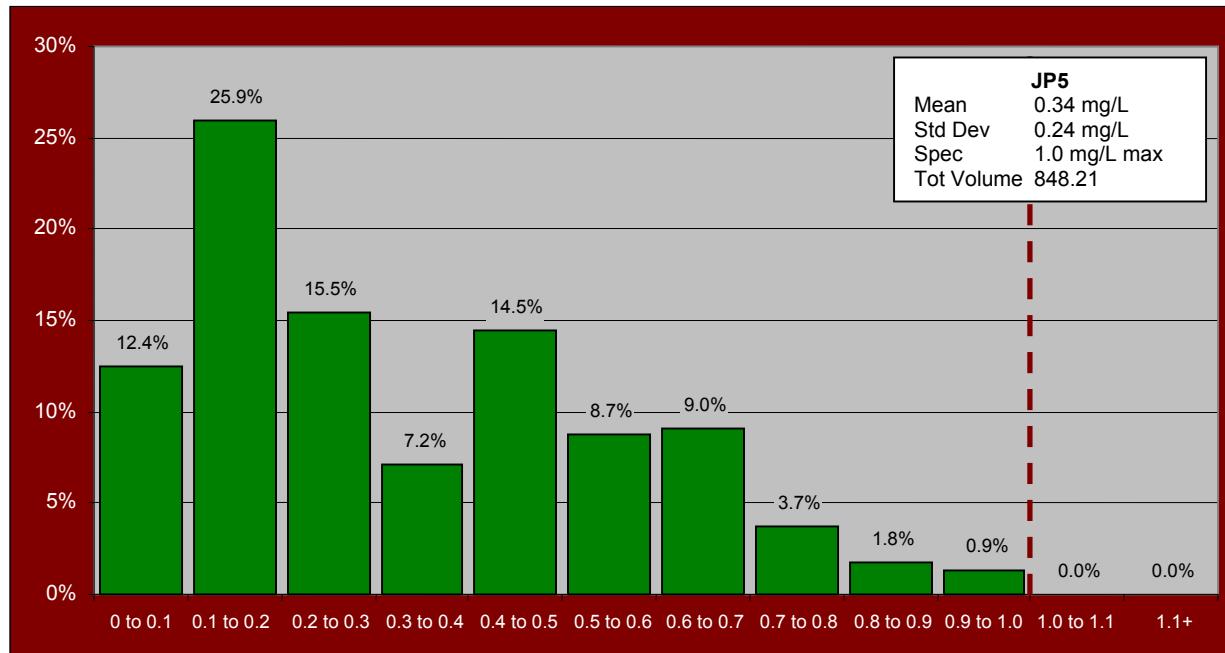
[Volume in Millions of Gallons]

Histogram 6. Mercaptan Sulfur in Volume Received – 2001.

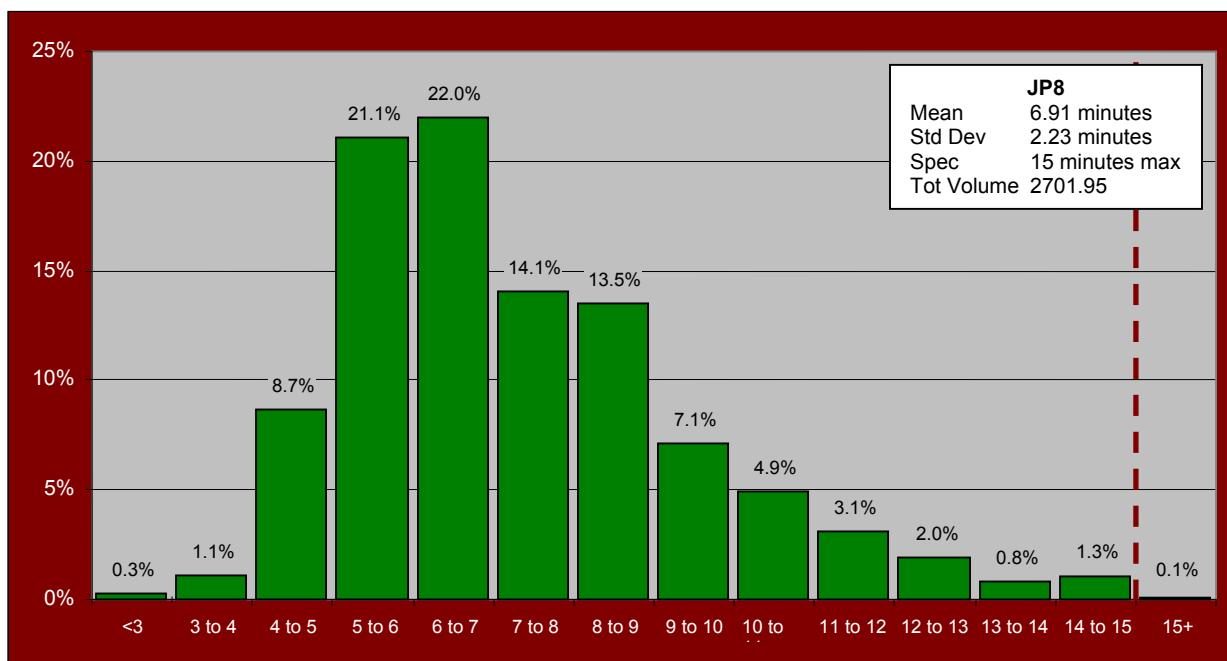
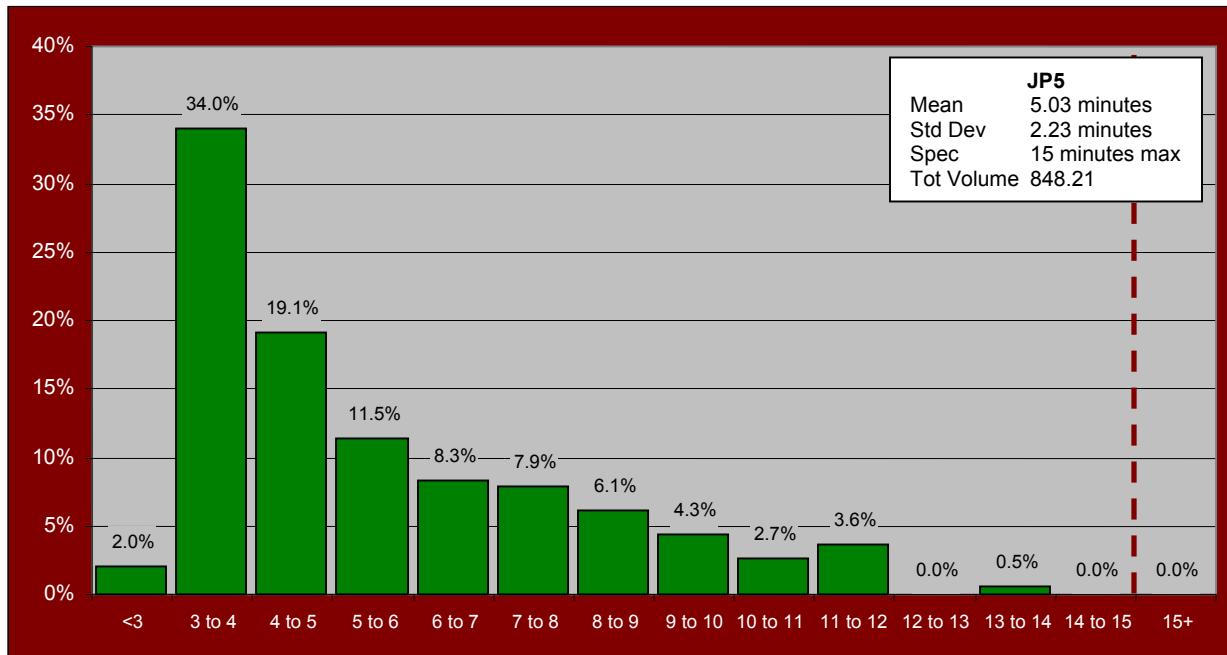
[Volume in Millions of Gallons]



Histogram 7. Particulate Contamination in Volume Received – 2001.



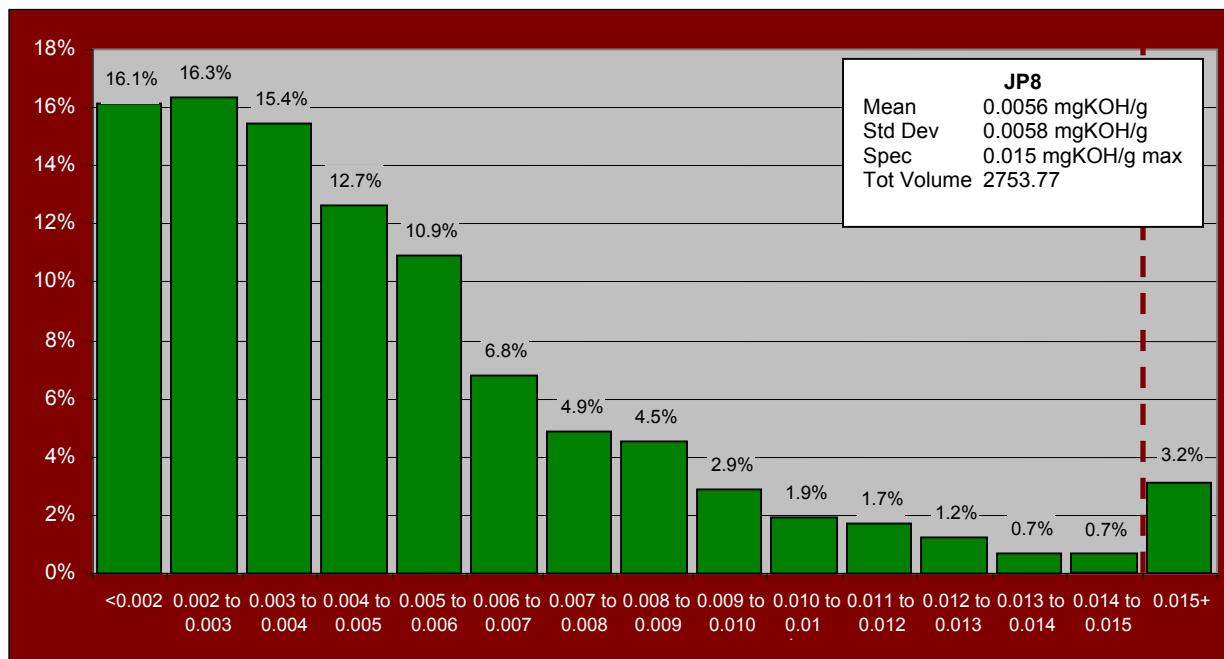
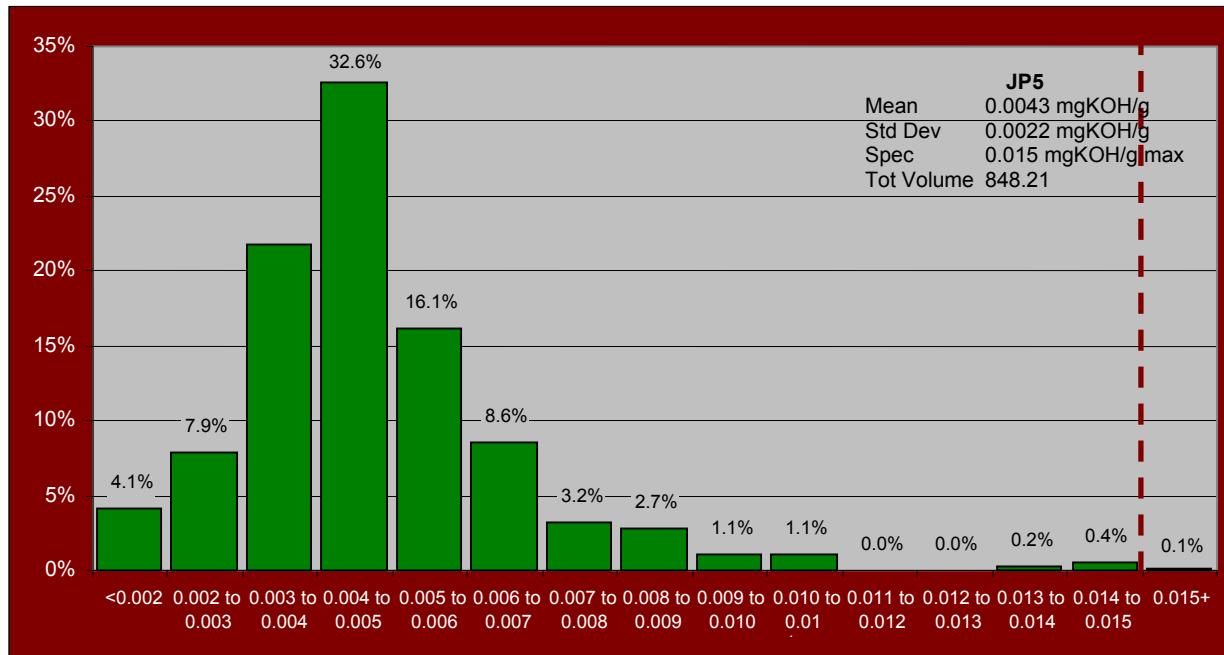
[Volume in Millions of Gallons]

Histogram 8. Filtration Time for Volume Received – 2001.

[Volume in Millions of Gallons]



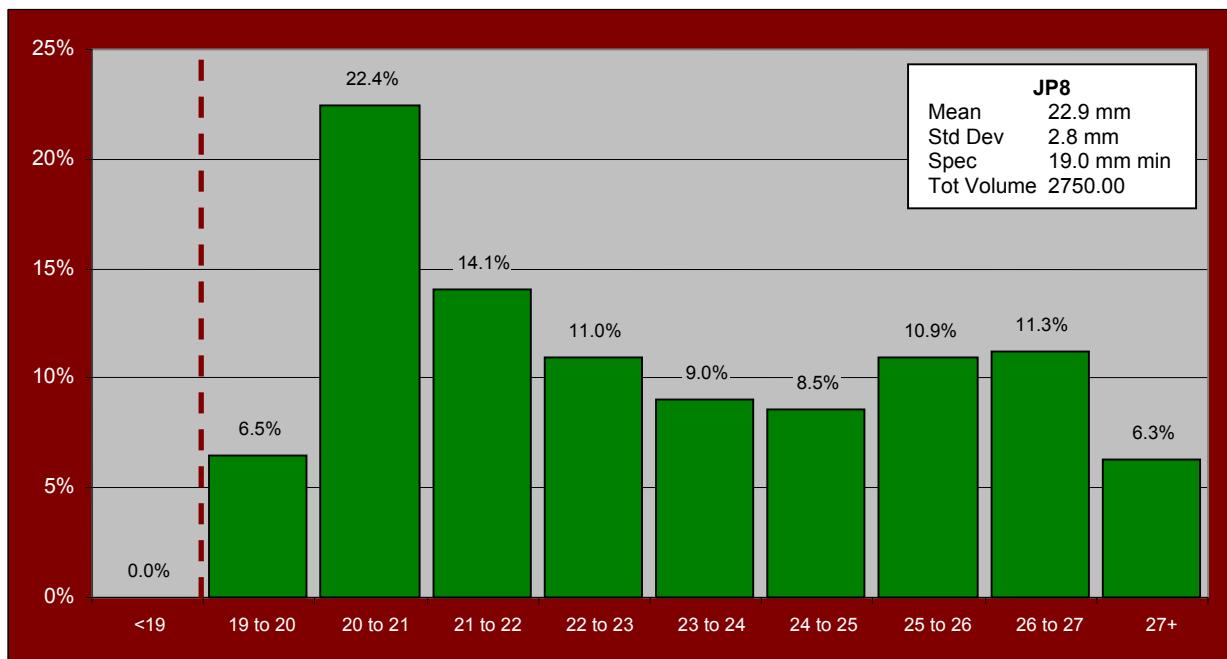
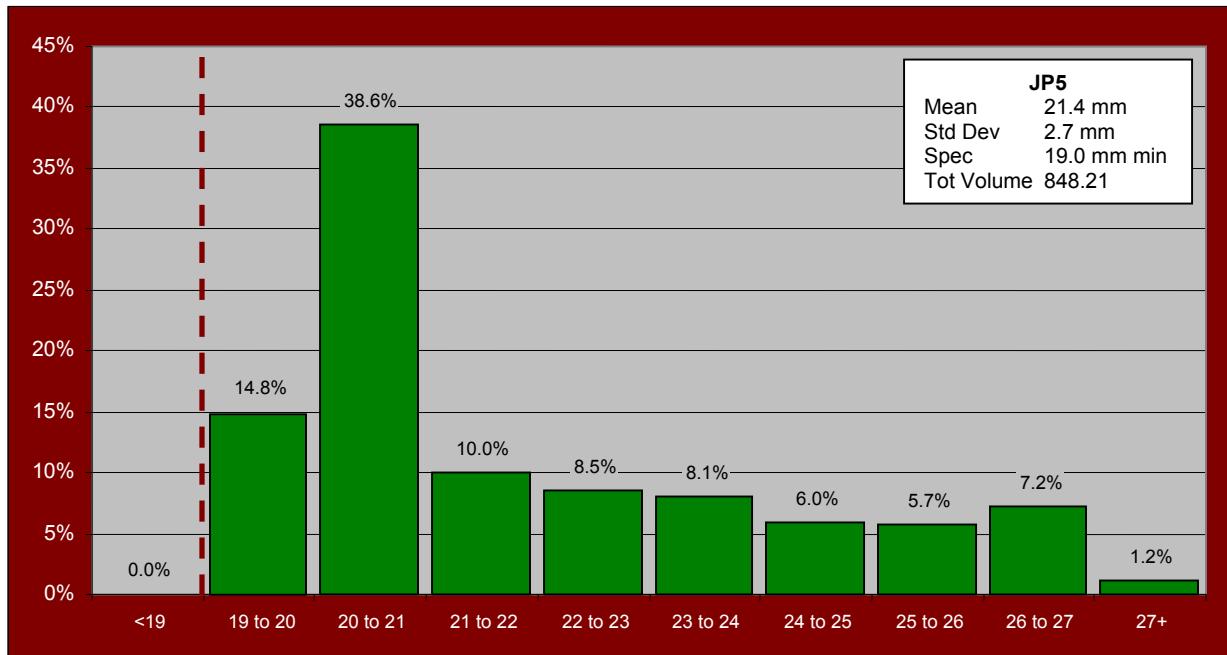
Histogram 9. Total Acid Number in Volume Received – 2001.



[Volume in Millions of Gallons]



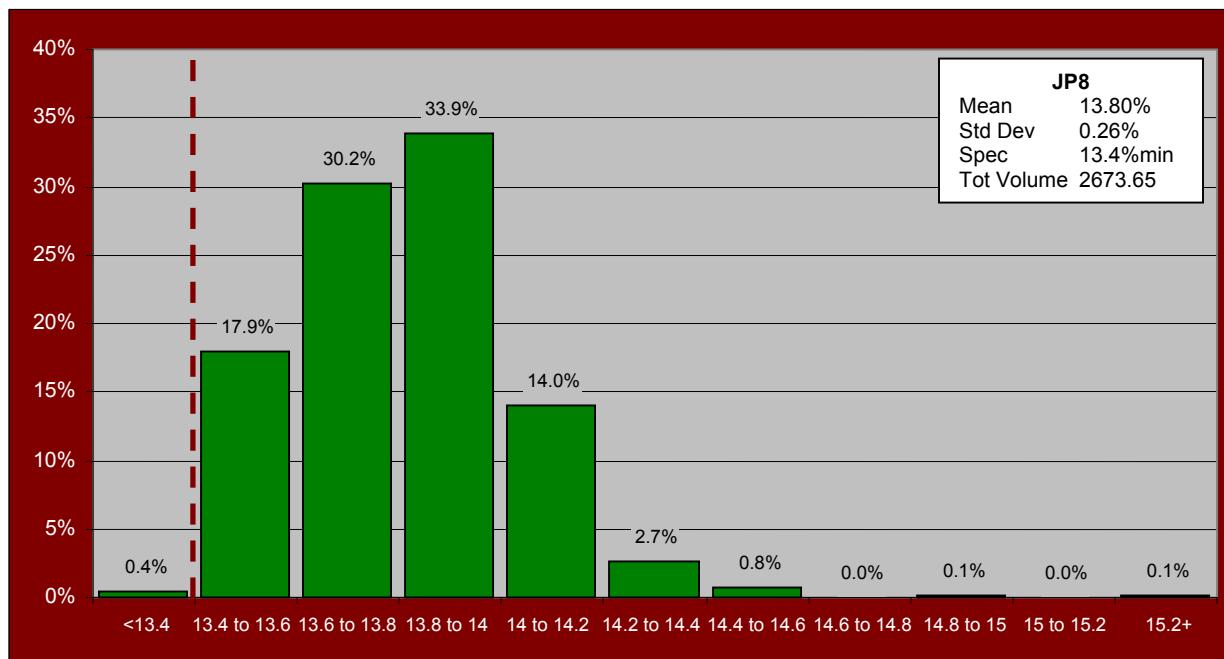
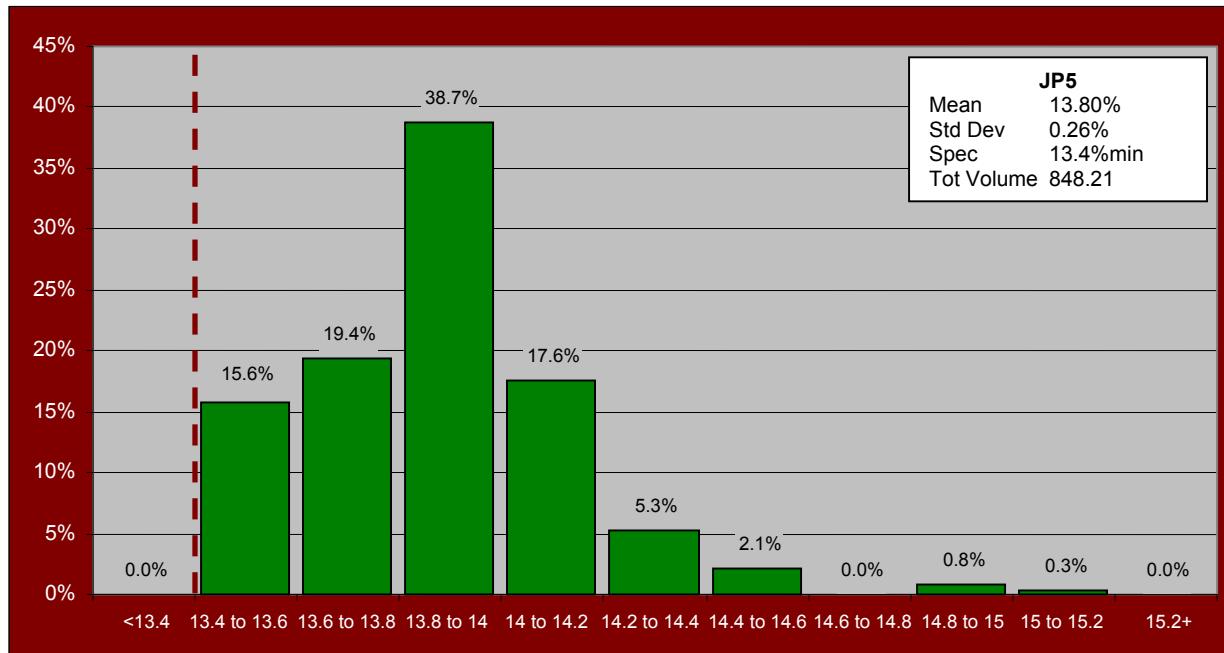
Histogram 10. Smoke Point in Volume Received – 2001.



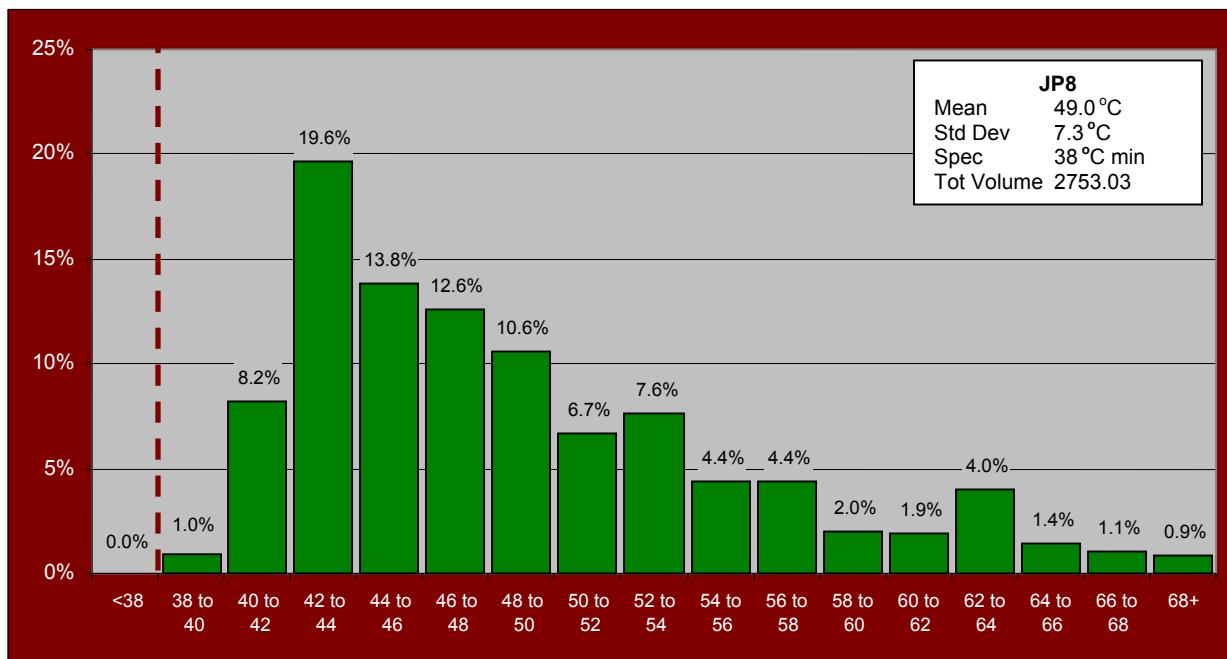
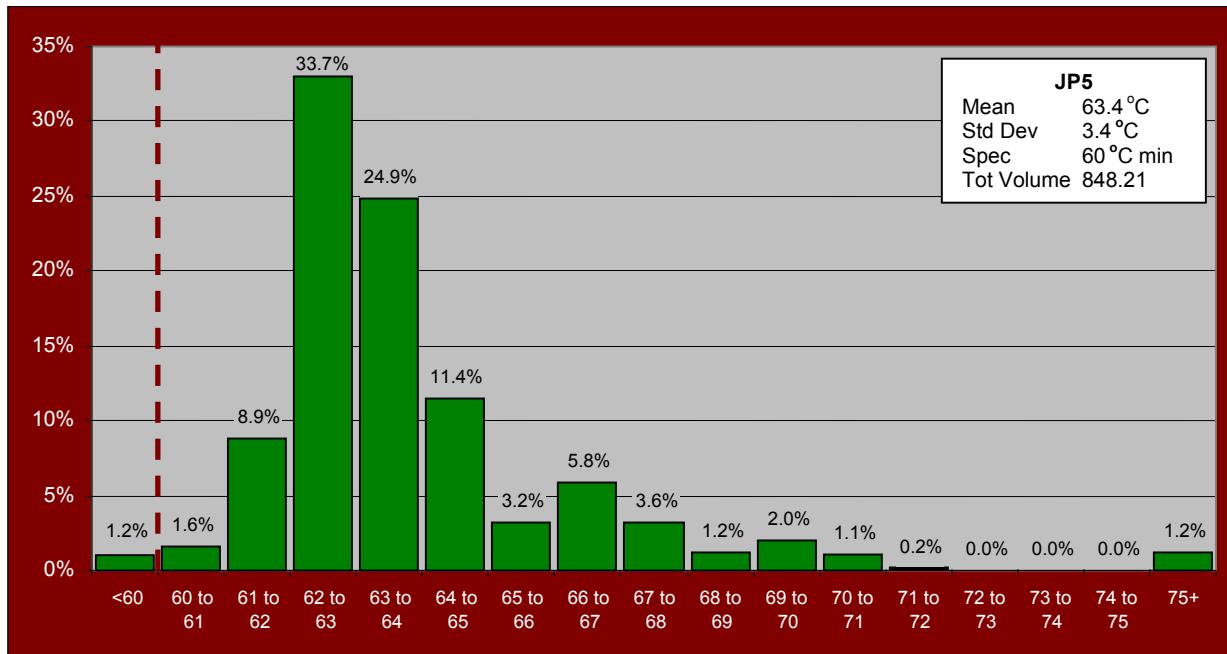
[Volume in Millions of Gallons]



Histogram 11. Hydrogen Content in Volume Received – 2001.



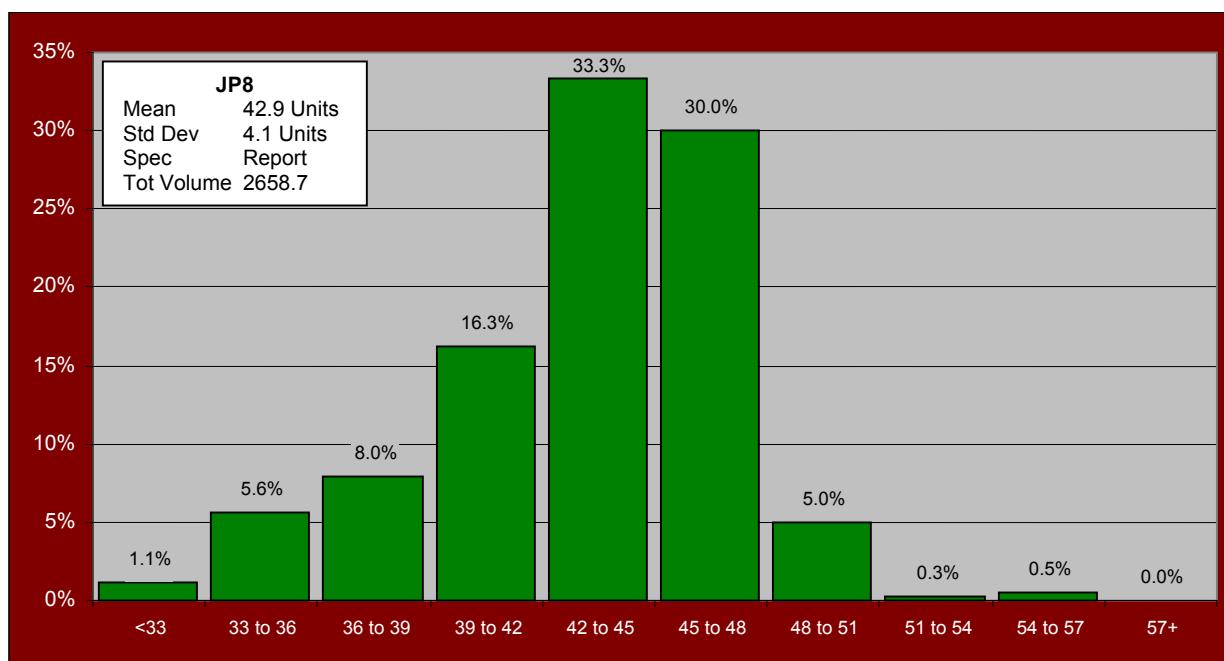
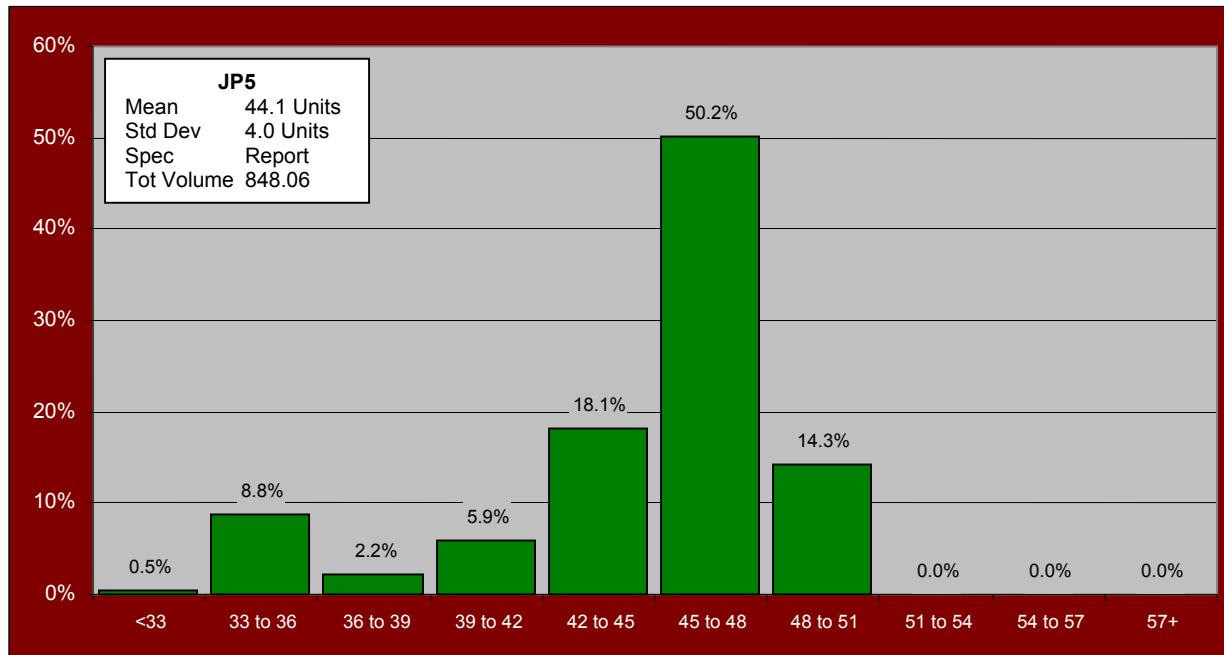
[Volume in Millions of Gallons]

Histogram 12. Flash Point in Volume Received – 2001.

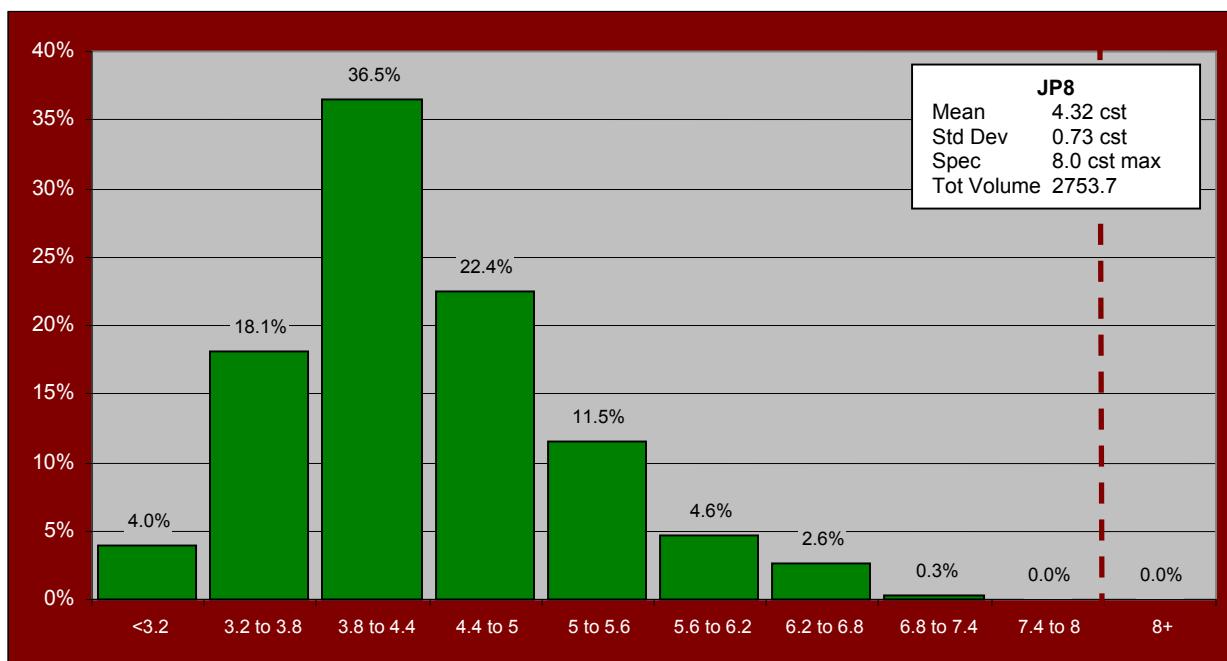
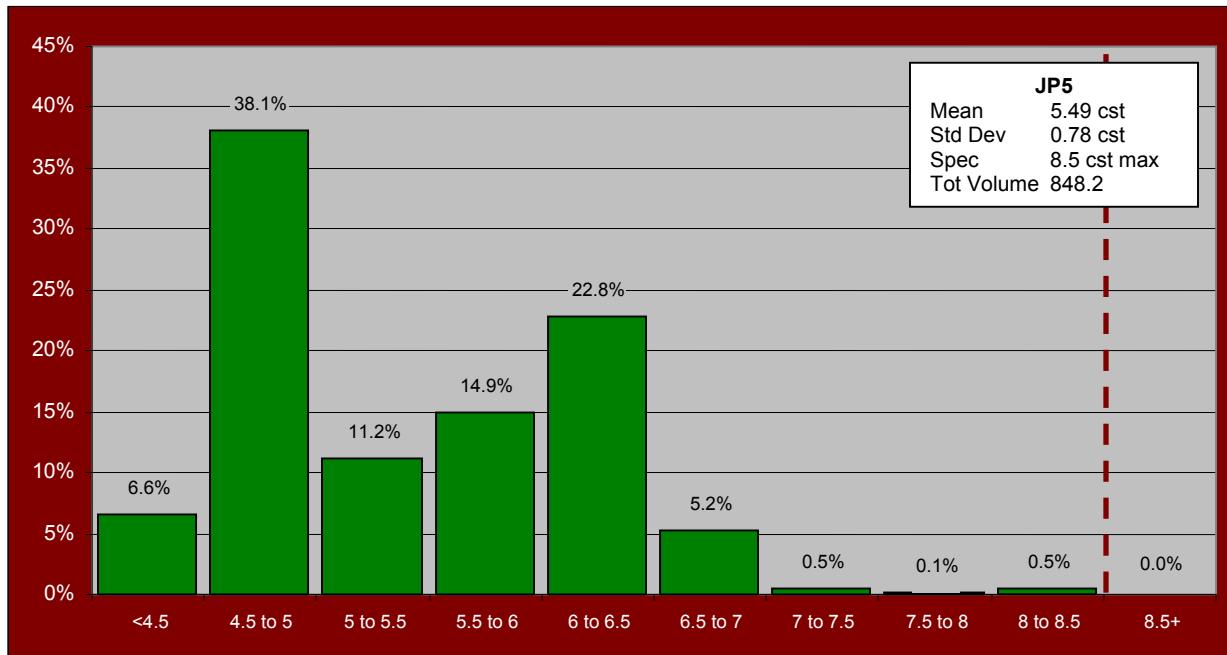
[Volume in Millions of Gallons]



Histogram 13. Cetane Index in Volume Received – 2001.



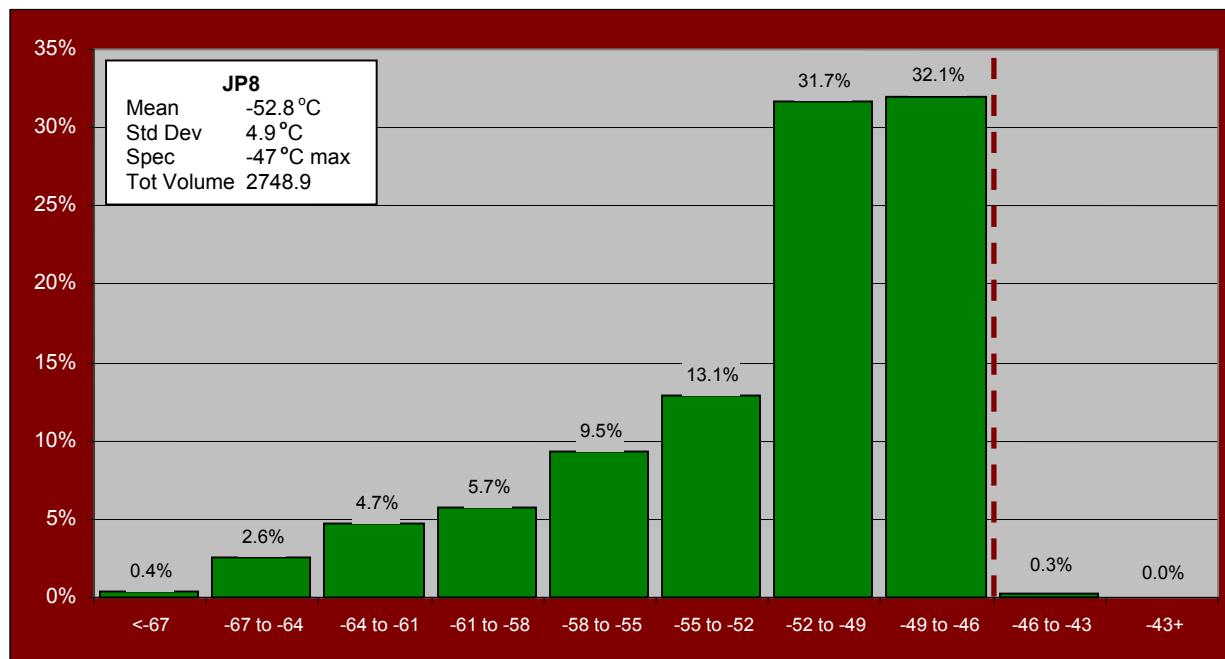
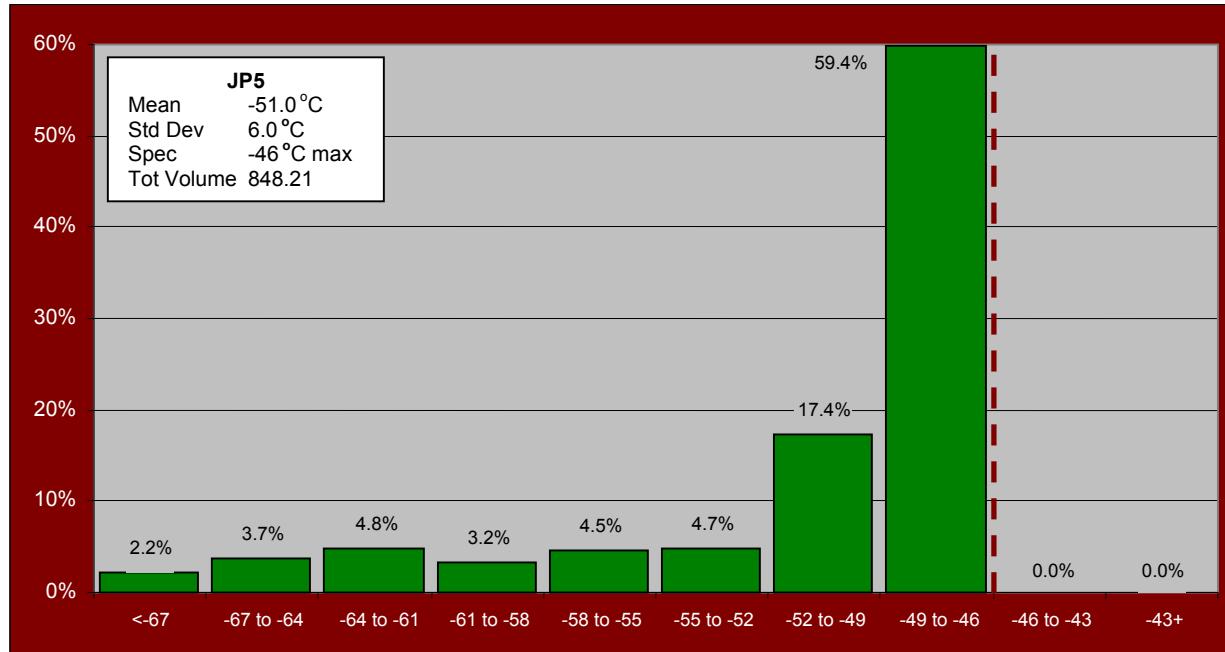
[Volume in Millions of Gallons]

Histogram 14. Viscosity in Volume Received – 2001.

[Volume in Millions of Gallons]



Histogram 15. Freezing Point in Volume Received – 2001.

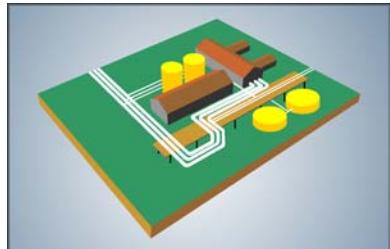


[Volume in Millions of Gallons]



Fuel Characteristics - Regional

Tables (7– 65) provide the minimum, average, volumetrically weighted average, and maximum values for each fuel property of the specified grade, categorized by calendar year and by region.



This supplements the preceding histograms, and facilitates the comparison of characteristics from different regions. Note that in each scope of reporting, summarization is based on a different focus, producing slightly different results.

Like the histograms, the conformance tables too are illustrative, in that they may not represent 100 percent of the particular fuel characteristic (see [The Data](#)), but they delineate sufficient data points to provide a quite accurate picture. It should be noted, however, that arithmetic means are based on “occurrence averages” (i.e. averaging on the submitted data for the characteristic). Supplied for each year and region combination is the number of reports from the field comprising the data set and the volume, in millions of gallons, of fuel that the data represents. Quantities represented may be contrasted against totals in [Table 4](#) and [Table 5](#), to determine any possible deviation.

Comments noting observed trends in product or test values are included in [Conclusions](#), where appropriate. Since Histograms and Tables are designed to be self-contained, to allow each to be useable removed from the main body of the report; these observations will need to be captured separately, if desired.

In perusing tables, it is possible to compare individual fuel characteristics from different regions. A researcher, attempting to determine what differences there may be in a comparison of regional averages for the API Gravity of JP8, for example, would consult [Table 10](#). The researcher could also contrast API Gravity, one fuel to another, comparing this data to the data in [Table 7](#), [Table 9](#), or [Table 8](#). For specificity, “actuals” may be compared to; and weighted against the amount of data recorded, as cited in the last column. Tables also afford year-to-year comparisons of the condition or attributes of fuels. Such an evaluation may be accomplished for any characteristic, governed in the specification, in consulting the appropriate table(s).

In utilizing this data to draw conclusions on the condition or composition of fuels, however, It is important to note that this data reflects "Level A procurement Quality test data"; that is to say, the results compiled from testing or evaluation at the point of origin. It must be recognized that the various transport mediums (pipeline, tankers, tank-truck, etc.) all have the potential to “contaminate” fuel, and that there is also the probability of mixing product from different sources/batches for allotment.

This could result in different values, in product finally delivered to the end user, to those recorded in spectender terminal shipping tank or refinery test results. DESC-BP can provide transportation data for first, second, and third tier bulk deliveries, but not information on (re)distribution or on what constitutes an individual allotment.

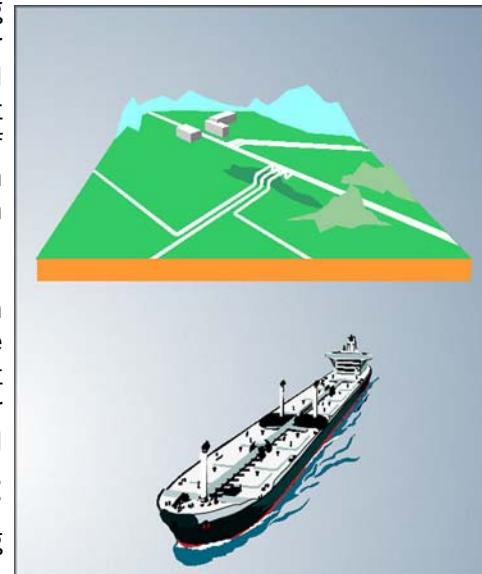




Table 7. API Gravity Conformance – F-76.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	3	F76	176.3	30.0	36.52	36.26	38.3	47
1999	5	F76	93.2	31.5	32.64	32.53	34.6	24
1999	7	F76	38.6	35.4	36.43	36.55	37.7	11
1999	8	F76	250.5	31.6	35.50	36.07	38.2	44
1999	9	F76	9.8	33.2	33.25	33.25	33.3	1
2000	1	F76	12.3	32.8	36.77	36.75	37.9	6
2000	3	F76	146.6	33.9	35.41	35.31	38.4	36
2000	5	F76	139.0	31.5	32.27	32.25	34.6	31
2000	6	F76	88.5	35.6	36.78	37.11	38.4	14
2000	7	F76	115.1	35.4	37.28	37.25	39.9	26
2000	8	F76	120.3	32.5	36.01	36.12	37.5	29
2000	9	F76	33.1	32.0	34.75	34.31	36.1	6
2001	1	F76	4.12	37.2	37.35	37.35	37.5	2
2001	3	F76	114.69	35.8	36.99	36.99	38.0	37
2001	5	F76	109.17	31.5	32.51	32.47	33.8	39
2001	6	F76	147.49	34.8	37.39	37.84	39.7	22
2001	7	F76	92.83	35.2	37.20	37.14	39.3	20
2001	8	F76	157.47	31.6	35.95	35.70	41.7	43
2001	9	F76	43.75	33.7	35.16	34.90	37.3	6

[Spec = 30.0 °API min] ☰ [Volume in Millions of Gallons]

Table 8. API Gravity Conformance – JP-5.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	2	JP5	15.9	43.7	44.07	44.09	44.6	32
1999	3	JP5	307.6	34.0	43.79	43.90	44.9	117
1999	5	JP5	168.1	28.8	38.36	39.08	42.5	53
1999	6	JP5	62.0	40.6	44.31	44.37	46.2	12
1999	7	JP5	52.6	41.3	42.94	43.54	45.6	13
1999	8	JP5	46.9	44.7	45.23	45.23	45.6	10
1999	9	JP5	19.6	42.3	42.50	42.50	42.7	2
2000	2	JP5	8.0	42.7	43.95	43.95	44.9	46
2000	3	JP5	308.8	42.1	44.07	44.14	45.5	116
2000	5	JP5	191.6	36.0	38.72	38.56	40.4	103
2000	6	JP5	60.9	40.7	43.63	43.60	46.1	11
2000	7	JP5	57.3	41.6	43.59	43.34	45.7	18
2000	8	JP5	61.4	40.6	44.51	44.80	45.7	12
2001	2	JP5	7.5	43.1	43.90	43.11	44.8	43
2001	3	JP5	327.4	41.8	44.17	44.23	52.7	125
2001	5	JP5	196.4	36.6	39.11	38.70	41.3	118
2001	6	JP5	59.2	44.2	45.41	45.41	46.2	12
2001	7	JP5	86.9	40.4	42.62	42.67	45.1	23
2001	8	JP5	160.9	40.5	43.38	43.64	45.4	35
2001	9	JP5	9.8	42.2	42.20	42.20	42.2	1

[Spec = 36.0 - 48.0 °API] ☰ [Volume in Millions of Gallons]



Table 9. API Gravity Conformance – JP-4.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	8	JP4	1.4	55.1	55.54	55.40	56.2	8
2000	8	JP4	1.1	54.6	55.85	55.99	56.3	12
2001	8	JP4	1.6	54.4	55.98	56.00	56.6	7

[Spec = 45.0 - 57.0°API] ☰ [Volume in Millions of Gallons]

Table 10. API Gravity Conformance – JP-8.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	1	JP8	104.2	39.9	43.40	44.86	47.4	137
1999	2	JP8	204.0	37.8	43.80	43.63	46.2	270
1999	3	JP8	1037.7	38.8	44.49	44.78	48.1	951
1999	4	JP8	92.4	42.3	45.17	45.28	49.9	198
1999	5	JP8	306.5	34.4	40.98	40.42	43.6	199
1999	7	JP8	316.7	40.9	45.04	45.40	48.8	118
1999	8	JP8	293.9	40.0	43.92	44.71	49.4	225
1999	9	JP8	47.0	45.1	46.24	46.07	47.5	7
1999	7	AN8	3.9	46.2	46.20	46.20	46.2	1
2000	1	JP8	108.9	40.0	43.19	44.38	46.3	137
2000	2	JP8	249.6	41.3	44.30	44.13	47.6	354
2000	3	JP8	1041.4	39.7	44.30	44.42	54.0	868
2000	4	JP8	101.8	41.2	45.60	45.42	47.4	225
2000	5	JP8	371.6	37.0	41.07	41.21	44.4	203
2000	7	JP8	177.5	41.3	45.61	46.29	48.9	81
2000	8	JP8	362.7	40.0	43.80	45.27	47.9	191
2000	9	JP8	122.1	44.2	45.29	45.29	46.7	16
2000	7	AN8	5.4	48.3	48.30	48.30	48.3	1
2001	1	JP8	38.4	40.0	42.47	43.89	45.8	71
2001	2	JP8	313.1	39.5	44.25	43.91	48.0	460
2001	3	JP8	1,074.1	30.9	44.41	44.23	49.9	886
2001	4	JP8	105.5	39.7	44.61	44.58	46.6	224
2001	5	JP8	443.2	37.0	40.68	40.91	43.4	282
2001	7	JP8	366.6	40.0	45.61	45.12	49.5	137
2001	8	JP8	331.6	41.6	44.12	45.25	48.6	264
2001	9	JP8	83.6	45.2	45.82	45.87	46.5	13

[Spec = 37.0 - 51.0°API] ☰ [Volume in Millions of Gallons]



Table 11. Aromatics Conformance – JP-5.

	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	2	JP5	15.9	12.6	14.01	14.20	15.4	32
1999	3	JP5	307.6	13.4	18.34	18.61	20.8	117
1999	5	JP5	168.1	11.2	15.97	15.71	21.0	53
1999	6	JP5	62.0	16.1	20.00	19.95	24.1	12
1999	7	JP5	52.6	14.7	18.99	18.17	21.0	13
1999	8	JP5	46.9	12.0	16.22	15.94	18.2	10
1999	9	JP5	19.6	16.1	16.35	16.35	16.6	2
2000	2	JP5	8.0	11.9	13.67	13.67	17.0	46
2000	3	JP5	308.8	12.9	17.86	18.09	24.3	116
2000	5	JP5	191.6	10.0	18.31	17.78	21.7	103
2000	6	JP5	60.9	16.0	18.58	18.66	22.0	11
2000	7	JP5	57.3	15.2	18.15	18.23	20.4	18
2000	8	JP5	61.4	15.3	17.82	17.60	20.0	12
2001	2	JP5	7.5	10.6	13.64	13.38	15.6	43
2001	3	JP5	327.4	13.3	17.68	17.81	20.8	125
2001	5	JP5	196.4	10.5	17.94	17.28	21.9	118
2001	6	JP5	59.3	12.0	15.83	15.84	18.6	12
2001	7	JP5	86.9	13.7	18.87	18.64	24.1	23
2001	8	JP5	160.9	10.5	17.29	17.05	20.6	35
2001	9	JP5	9.8	14.5	14.50	14.50	14.5	1

[Spec = 25% max] ☰ [Volume in Millions of Gallons]



Table 12. Aromatics Conformance – JP-4.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	8	JP4	1.4	7.1	8.94	9.06	10.5	8
2000	8	JP4	1.1	6.7	7.76	7.81	8.9	12
2001	8	JP4	1.6	7.0	7.90	8.20	9.2	7

[Spec = 25% max] ☰ [Volume in Millions of Gallons]

Table 13. Aromatics Conformance - JP-8.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	1	JP8	104.2	11.0	19.18	17.34	23.6	137
1999	2	JP8	204.0	9.5	15.23	15.27	22.0	270
1999	3	JP8	1037.7	7.9	17.77	17.97	24.7	951
1999	4	JP8	92.4	11.4	15.98	16.16	22.4	198
1999	5	JP8	306.5	10.1	19.05	18.18	25.0	199
1999	7	JP8	316.7	9.8	16.60	16.59	21.4	118
1999	8	JP8	293.9	7.9	18.43	17.74	21.6	225
1999	9	JP8	47.0	19.4	20.00	20.11	21.8	7
1999	7	AN8	3.9	17.7	17.70	17.70	17.7	1
2000	1	JP8	108.9	12.6	18.54	16.76	23.0	137
2000	2	JP8	249.6	11.0	14.77	14.87	22.2	353
2000	3	JP8	1041.4	12.3	18.43	19.26	24.9	868
2000	4	JP8	101.8	6.2	14.57	15.26	22.5	225
2000	5	JP8	371.6	10.8	18.44	17.60	22.5	203
2000	7	JP8	177.5	10.1	16.90	15.85	24.8	81
2000	8	JP8	362.7	10.3	18.52	17.49	22.1	191
2000	9	JP8	122.1	18.4	20.90	20.86	21.9	16
2000	7	AN8	5.4	15.3	15.30	15.30	15.3	1
2001	1	JP8	38.4	13.4	19.81	16.74	23.3	71
2001	2	JP8	313.1	9.6	14.92	15.56	23.3	460
2001	3	JP8	1,074.1	0.2	18.57	19.45	25.0	886
2001	4	JP8	105.5	7.3	15.80	16.06	24.0	224
2001	5	JP8	443.2	5.5	17.27	16.66	22.8	281
2001	7	JP8	366.6	10.7	17.32	16.83	24.3	140
2001	8	JP8	331.6	6.7	17.84	17.22	22.7	254
2001	9	JP8	83.6	19.2	20.03	19.98	20.4	13

[Spec = 25% max] ☰ [Volume in Millions of Gallons]



Table 14. Olefins Conformance – JP-5.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	2	JP5	15.6	0.8	1.62	1.41	3.4	32
1999	3	JP5	307.6	0.1	0.96	0.20	1.7	29
1999	5	JP5	168.1	0.5	1.17	0.62	2.3	24
1999	6	JP5	62.0	0.0	0.0	0.00	0.0	0
1999	7	JP5	52.6	1.2	1.20	1.20	1.2	1
1999	8	JP5	46.9	0.0	0.0	0.00	0.0	0
1999	9	JP5	19.6	1.2	1.20	1.20	1.2	1
2000	2	JP5	8.0	0.6	1.93	1.91	3.7	46
2000	3	JP5	38.0	0.1	0.90	0.89	1.7	19
2000	5	JP5	128.4	0.6	1.58	1.58	3.9	77
2000	7	JP5	17.0	0.5	0.73	0.67	0.9	7
2001	2	JP5	4.4	0.6	1.48	1.49	2.6	25
2001	3	JP5	38.1	0.8	1.48	1.49	2.2	19
2001	5	JP5	37.8	1.4	3.69	3.82	7.8	28
2001	7	JP5	8.0	0.9	0.90	0.90	0.9	2

[Spec = 5% max] ☐ [Volume in Millions of Gallons]



Table 15. Olefins Conformance – JP-4.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	8	JP4	1.4	0.0	0.22	0.05	1.8	8
2000	8	JP4	1.1	0.0	0.08	0.05	1.0	12
2001	8	JP4	1.6	0.0	0.00	0.00	0.0	2

[Spec = 5% max] ☰ [Volume in Millions of Gallons]

Table 16. Olefins Conformance – JP-8.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	1	JP8	104.2	0.1	1.31	1.68	3.9	137
1999	2	JP8	204.0	0.5	1.36	1.32	5.0	269
1999	3	JP8	1037.7	0.0	1.01	1.01	4.0	947
1999	4	JP8	92.4	0.0	1.44	1.31	4.9	198
1999	5	JP8	306.5	0.2	1.17	1.35	5.0	199
1999	7	JP8	316.7	0.0	0.84	0.93	4.6	118
1999	8	JP8	293.9	0.0	1.02	0.92	4.9	225
1999	9	JP8	47.0	0.5	0.59	0.60	0.7	7
1999	7	AN8	3.9	0.4	0.40	0.40	0.4	1
2000	1	JP8	108.9	0.6	1.52	1.93	3.8	137
2000	2	JP8	245.7	0.8	1.28	1.37	5.0	349
2000	3	JP8	872.3	0.1	1.081	1.07	4.0	788
2000	4	JP8	101.8	0.3	1.45	1.43	4.6	225
2000	5	JP8	332.4	0.3	1.22	1.42	4.0	183
2000	7	JP8	174.8	0.1	0.42	0.36	0.9	80
2000	8	JP8	362.7	0.0	0.85	0.79	3.2	191
2000	9	JP8	122.1	0.4	0.63	0.61	0.8	16
2001	1	JP8	38.4	0.7	1.37	1.72	4.3	71
2001	2	JP8	289.4	0.4	2.01	2.31	7.0	436
2001	3	JP8	462.1	0.0	1.18	1.32	5.0	535
2001	4	JP8	71.1	0.6	1.67	1.58	4.2	175
2001	5	JP8	113.8	0.5	1.84	1.64	4.3	42
2001	7	JP8	253.2	0.3	0.64	0.60	1.9	81
2001	8	JP8	105.5	0.0	0.92	0.80	2.7	102
2001	9	JP8	83.6	0.5	0.60	0.61	0.7	13

[Spec = 5% max] ☰ [Volume in Millions of Gallons]



Table 17. Total Sulfur Conformance – F-76.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	3	F76	176.3	0.030	0.4633	0.4871	0.850	47
1999	5	F76	93.2	0.146	0.3915	0.3880	0.526	24
1999	7	F76	38.6	0.160	0.6882	0.6787	0.980	11
1999	8	F76	250.5	0.220	0.5461	0.5048	0.950	44
1999	9	F76	9.8	0.146	0.1460	0.1460	0.146	1
2000	1	F76	12.3	0.013	0.0181	0.0181	0.026	6
2000	3	F76	146.6	0.044	0.6060	0.6346	0.990	36
2000	5	F76	139.0	0.450	0.5103	0.5105	0.580	31
2000	6	F76	88.5	0.470	0.7857	0.7351	0.990	14
2000	7	F76	115.1	0.102	0.4185	0.3763	0.950	26
2000	8	F76	120.3	0.060	0.5883	0.6436	0.960	29
2001	1	F76	4.1	0.034	0.0356	0.0356	0.038	2
2001	3	F76	114.7	0.023	0.5516	0.5330	0.880	37
2001	5	F76	109.2	0.156	0.4652	0.4829	0.589	39
2001	6	F76	147.5	0.290	0.6705	0.6245	1.020	22
2001	7	F76	92.8	0.042	0.3345	0.2975	0.910	20
2001	8	F76	157.5	0.028	0.5034	0.5888	0.800	43
2001	9	F76	43.7	0.042	0.0777	0.0826	0.119	6

[Spec = 1.0% max] ☰ [Volume in Millions of Gallons]

Table 18. Total Sulfur Conformance – JP-5.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	2	JP5	15.6	0.070	0.1177	0.1230	0.142	32
1999	3	JP5	307.6	0.060	0.1017	0.1034	0.140	117
1999	5	JP5	168.1	0.000	0.0161	0.0165	0.080	53
1999	6	JP5	62.0	0.010	0.0100	0.0100	0.010	12
1999	7	JP5	52.6	0.001	0.0559	0.0949	0.240	13
1999	8	JP5	46.9	0.010	0.1650	0.1544	0.280	10
1999	9	JP5	19.6	0.000	0.0015	0.0015	0.003	2
2000	2	JP5	8.0	0.054	0.0935	0.0928	0.156	46
2000	3	JP5	308.8	0.000	0.0893	0.0897	0.120	116
2000	5	JP5	191.6	0.000	0.0118	0.0125	0.057	103
2000	6	JP5	60.9	0.010	0.0100	0.0100	0.010	11
2000	7	JP5	57.3	0.001	0.0236	0.0262	0.230	18
2001	2	JP5	7.5	0.058	0.0806	0.0806	0.140	44
2001	3	JP5	327.4	0.040	0.1245	0.1263	0.170	125
2001	5	JP5	196.4	0.000	0.0215	0.0189	0.080	118
2001	6	JP5	59.3	0.001	0.0092	0.0093	0.010	12
2001	7	JP5	86.9	0.001	0.0283	0.0264	0.400	23
2001	8	JP5	160.9	0.020	0.1230	0.1277	0.230	35
2001	9	JP5	9.8	0.010	0.0100	0.0100	0.010	1

[Spec = 0.4% max] ☰ [Volume in Millions of Gallons]



Table 19. Total Sulfur Conformance – JP-4.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	8	JP4	1.4	0.030	0.0412	0.0426	0.050	8
2000	8	JP4	1.1	0.030	0.0392	0.0410	0.050	12
2001	8	JP4	1.6	0.030	0.0314	0.0312	0.040	7

[Spec = 0.4% max] ☰ [Volume in Millions of Gallons]

Table 20. Total Sulfur Conformance – JP-8.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	1	JP8	104.17	0.000	0.0317	0.0301	0.289	137
1999	2	JP8	204.00	0.000	0.1021	0.0976	0.280	270
1999	3	JP8	1037.72	0.000	0.0446	0.0537	0.295	951
1999	4	JP8	92.41	0.000	0.0184	0.0208	0.052	198
1999	5	JP8	306.48	0.000	0.0696	0.0611	0.328	199
1999	7	JP8	316.74	0.002	0.0540	0.0660	0.300	118
1999	8	JP8	293.85	0.000	0.0740	0.0587	0.140	225
1999	9	JP8	47.03	0.012	0.0451	0.0406	0.190	7
1999	7	AN8	3.92	0.030	0.0300	0.0300	0.030	1
2000	1	JP8	108.9	0.000	0.0264	0.0343	0.054	137
2000	2	JP8	249.6	0.000	0.0855	0.0866	0.300	353
2000	3	JP8	1041.4	0.000	0.0425	0.0526	0.214	868
2000	4	JP8	101.8	0.000	0.0251	0.0279	0.130	225
2000	5	JP8	371.6	0.002	0.0939	0.0674	0.230	203
2000	7	JP8	177.5	0.003	0.1017	0.1475	0.350	81
2000	8	JP8	362.7	0.003	0.0819	0.0603	0.230	191
2000	9	JP8	122.1	0.001	0.0289	0.0284	0.046	16
2000	7	AN8	5.4	0.110	0.1100	0.1100	0.110	1
2001	1	JP8	38.4	0.000	0.0204	0.0304	0.048	71
2001	2	JP8	313.1	0.000	0.0810	0.0931	0.300	460
2001	3	JP8	1,074.1	0.000	0.0418	0.0451	0.360	887
2001	4	JP8	105.5	0.000	0.0130	0.0174	0.050	225
2001	5	JP8	443.2	0.003	0.0841	0.0600	0.266	282
2001	7	JP8	366.6	0.000	0.0785	0.1110	0.290	140
2001	8	JP8	331.6	0.001	0.0841	0.0664	0.300	264
2001	9	JP8	83.6	0.030	0.0636	0.0778	0.380	13

[Spec = 0.4% max] ☰ [Volume in Millions of Gallons]



Table 21. Mercaptan Sulfur Conformance – JP-5.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	2	JP5	15.6	0.0000	0.00062	0.00085	0.0015	32
1999	3	JP5	307.6	0.0001	0.00096	0.00099	0.0040	117
1999	5	JP5	168.1	0.0001	0.00026	0.00024	0.0012	38
1999	7	JP5	52.6	0.0001	0.00052	0.00065	0.0015	12
1999	8	JP5	46.9	0.0003	0.00083	0.00078	0.0014	10
2000	2	JP5	4.1	0.0000	0.00029	0.00030	0.0012	24
2000	3	JP5	308.8	0.0000	0.00114	0.00116	0.0040	116
2000	5	JP5	65.3	0.0001	0.00020	0.00020	0.0005	27
2000	7	JP5	55.6	0.0001	0.00039	0.00036	0.0014	17
2001	2	JP5	0.9	0.0000	0.00060	0.00060	0.0010	5
2001	3	JP5	327.4	0.0000	0.00147	0.00152	0.0020	125
2001	5	JP5	61.2	0.0001	0.00024	0.00024	0.0004	28
2001	7	JP5	86.9	0.0001	0.00034	0.00032	0.0020	23
2001	8	JP5	160.9	0.0001	0.00097	0.00100	0.0018	35

[Spec = 0.002% max] ☰ [Volume in Millions of Gallons]



Table 22. Mercaptan Sulfur Conformance – JP-4.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	8	JP4	1.4	0.0000	0.00061	0.00063	0.0010	8
2000	8	JP4	1.1	0.0002	0.00084	0.00078	0.0015	12
2001	8	JP4	1.6	0.0002	0.00087	0.00097	0.0015	7

[Spec = 0.002% max] ☰ [Volume in Millions of Gallons]

Table 23. Mercaptan Sulfur Conformance – JP-8.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	1	JP8	104.2	0.0003	0.00033	0.00030	0.0019	64
1999	2	JP8	204.0	0.0000	0.00120	0.00095	0.0020	232
1999	3	JP8	1037.7	0.0000	0.00086	0.00082	0.0029	683
1999	4	JP8	92.4	0.0000	0.00103	0.00102	0.0020	166
1999	5	JP8	306.5	0.0001	0.00106	0.00058	0.0021	67
1999	7	JP8	316.7	0.0001	0.00078	0.00077	0.0040	97
1999	8	JP8	293.8	0.0002	0.00063	0.00046	0.0016	183
1999	9	JP8	47.0	0.0001	0.00027	0.00025	0.0005	7
1999	7	AN8	3.9	0.0012	0.00120	0.00120	0.0012	1
2000	1	JP8	104.0	0.0001	0.00037	0.00037	0.0030	78
2000	2	JP8	210.8	0.0000	0.00119	0.00114	0.0020	308
2000	3	JP8	1000.1	0.0000	0.00085	0.00090	0.0020	721
2000	4	JP8	75.7	0.0000	0.00075	0.00067	0.0020	146
2000	5	JP8	341.9	0.0001	0.00098	0.00092	0.0020	126
2000	7	JP8	166.5	0.0001	0.00121	0.00131	0.0030	70
2000	8	JP8	182.4	0.0002	0.00078	0.00085	0.0070	147
2000	9	JP8	122.1	0.0001	0.00020	0.00019	0.0003	16
2000	7	AN8	5.4	0.0007	0.00070	0.00070	0.0007	1
2001	1	JP8	31.9	0.0000	0.00027	0.00027	0.0005	21
2001	2	JP8	215.4	0.0001	0.00107	0.00119	0.0033	346
2001	3	JP8	723.9	0.0000	0.00094	0.00098	0.0030	633
2001	4	JP8	87.8	0.0000	0.00080	0.00072	0.0020	163
2001	5	JP8	332.8	0.0000	0.00082	0.00071	0.0020	152
2001	7	JP8	297.5	0.0003	0.00116	0.00127	0.0035	96
2001	8	JP8	286.1	0.0000	0.00085	0.00084	0.0026	247
2001	9	JP8	83.6	0.0001	0.00039	0.00044	0.0020	13

[Spec = 0.002% max] ☰ [Volume in Millions of Gallons]



Table 24. Particulate Contamination Conformance – F-76.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	3	F76	176.3	0.10	2.147	2.480	10.0	47
1999	5	F76	93.2	0.70	2.808	2.951	9.10	24
1999	7	F76	38.6	1.50	4.021	4.079	7.10	11
1999	8	F76	250.5	0.00	1.742	1.801	4.00	44
1999	9	F76	9.8	1.20	1.200	1.200	1.20	1
2000	1	F76	12.3	0.15	1.242	1.249	3.30	6
2000	3	F76	146.6	0.10	2.467	2.605	7.70	36
2000	5	F76	139.0	0.30	2.484	2.256	8.20	31
2000	6	F76	88.5	1.00	3.607	3.468	6.80	14
2000	7	F76	115.1	0.80	2.323	2.193	5.80	26
2000	8	F76	120.3	0.00	0.928	0.876	2.00	29
2001	1	F76	4.1	1.20	1.650	1.643	2.10	2
2001	3	F76	114.7	0.00	1.445	1.506	5.70	37
2001	5	F76	109.2	0.10	3.111	2.678	7.00	39
2001	6	F76	147.5	1.00	2.868	2.681	6.00	22
2001	7	F76	92.8	1.40	2.615	2.620	6.80	20
2001	8	F76	157.5	0.30	1.028	1.052	2.00	43
2001	9	F76	43.7	1.00	2.367	2.626	7.40	6

[Spec = 10 mg/L max] ☐ [Volume in Millions of Gallons]

Table 25. Particulate Contamination Conformance – JP-5.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	2	JP5	15.6	0.20	0.577	0.718	1.00	32
1999	3	JP5	307.6	0.01	0.223	0.217	1.00	117
1999	5	JP5	168.1	0.00	0.298	0.272	1.00	53
1999	6	JP5	62.0	0.10	0.393	0.396	0.68	12
1999	7	JP5	52.6	0.20	0.430	0.466	0.78	13
1999	8	JP5	46.9	0.40	0.572	0.586	0.80	10
1999	9	JP5	19.6	0.32	0.475	0.476	0.63	2
2000	2	JP5	8.0	0.10	0.442	0.441	0.90	46
2000	3	JP5	308.8	0.03	0.162	0.157	1.60	116
2000	5	JP5	191.6	0.00	0.386	0.394	1.00	103
2000	6	JP5	60.9	0.39	0.557	0.565	0.75	11
2000	7	JP5	57.3	0.08	0.438	0.387	0.90	18
2001	2	JP5	7.5	0.20	0.560	0.563	1.00	43
2001	3	JP5	327.4	0.02	0.146	0.142	0.84	125
2001	5	JP5	196.4	0.00	0.412	0.417	1.00	118
2001	6	JP5	59.3	0.21	0.467	0.464	0.79	12
2001	7	JP5	86.9	0.10	0.433	0.430	0.90	23
2001	8	JP5	160.9	0.11	0.373	0.389	0.80	35
2001	9	JP5	9.8	0.48	0.480	0.480	0.48	1

[Spec = 1.0 mg/L max] ☐ [Volume in Millions of Gallons]



Table 26. Particulate Contamination Conformance – JP-4.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	8	JP4	1.4	0.05	0.556	0.540	0.80	8
2000	8	JP4	1.1	0.16	0.409	0.623	0.95	12
2001	8	JP4	1.6	0.16	0.347	0.328	0.63	7

[Spec = 1.0 mg/L max] ☰ [Volume in Millions of Gallons]

Table 27. Particulate Contamination Conformance – JP-8.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	1	JP8	104.2	0.00	0.239	0.320	1.00	137
1999	2	JP8	204.0	0.08	0.465	0.476	1.00	270
1999	3	JP8	1037.7	0.00	0.323	0.357	1.20	951
1999	4	JP8	92.4	0.01	0.315	0.306	0.98	198
1999	5	JP8	306.5	0.00	0.328	0.328	1.00	199
1999	7	JP8	316.7	0.01	0.403	0.414	1.00	118
1999	8	JP8	293.8	0.00	0.340	0.494	0.90	225
1999	9	JP8	47.0	0.20	0.343	0.333	0.60	7
1999	7	AN8	3.9	0.97	0.970	0.970	0.97	1
2000	1	JP8	108.9	0.00	0.200	0.236	1.00	137
2000	2	JP8	249.6	0.03	0.348	0.360	1.29	354
2000	3	JP8	1041.4	0.00	0.366	0.384	1.30	868
2000	4	JP8	101.8	0.03	0.335	0.322	1.00	225
2000	5	JP8	371.6	0.06	0.365	0.296	1.80	203
2000	7	JP8	177.5	0.02	0.341	0.417	0.95	80
2000	8	JP8	362.7	0.00	0.336	0.509	1.00	191
2000	9	JP8	122.1	0.10	0.388	0.398	0.60	16
2000	7	AN8	5.4	0.40	0.400	0.400	0.40	1
2001	1	JP8	38.4	0.00	0.157	0.319	0.98	71
2001	2	JP8	313.1	0.02	0.362	0.394	7.00	460
2001	3	JP8	1,074.1	0.00	0.356	0.331	1.00	886
2001	4	JP8	105.5	0.00	0.322	0.305	0.98	224
2001	5	JP8	443.2	0.00	0.331	0.307	1.00	282
2001	7	JP8	366.6	0.01	0.386	0.409	0.98	115
2001	8	JP8	331.6	0.02	0.300	0.331	0.98	264
2001	9	JP8	83.6	0.30	0.385	0.391	0.60	13

[Spec = 1.0 mg/L max] ☰ [Volume in Millions of Gallons]



Table 28. Filtration Time Conformance – JP-5.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	2	JP5	15.6	4	5.9	7.8	9	32
1999	3	JP5	307.6	2	3.2	3.1	6	117
1999	5	JP5	168.1	3	7.1	6.7	14	52
1999	6	JP5	62.0	8	10.8	10.8	13	12
1999	7	JP5	52.6	4	6.0	5.8	8	13
1999	8	JP5	46.9	4	4.9	4.9	7	10
1999	9	JP5	19.6	2	4.5	4.5	7	2
2000	2	JP5	8.0	4	7.2	7.2	11	46
2000	3	JP5	308.8	2	3.4	3.3	8	116
2000	5	JP5	191.6	3	5.4	5.8	12	103
2000	6	JP5	60.9	8	10.0	10.2	13	11
2000	7	JP5	57.3	3	6.1	5.7	12	18
2001	2	JP5	7.5	4	6.2	6.10	10	43
2001	3	JP5	327.4	2	3.5	3.45	11	125
2001	5	JP5	196.4	3	5.5	6.00	11	118
2001	6	JP5	59.3	8	10.2	10.11	13	12
2001	7	JP5	86.9	3	5.4	5.49	8	23
2001	8	JP5	160.9	3	5.3	5.06	8	35
2001	9	JP5	9.8	5	5.0	5.00	5	1

[Spec = 15 minutes max] ☰ [Volume in Millions of Gallons]



Table 29. Filtration Time Conformance - JP-4.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	8	JP4	1.42	4	4.75	4.78	7	8
2000	8	JP4	1.1	4	5.6	6.5	9	12
2001	8	JP4	1.6	5	5.4	5.4	6	7

[Spec = 15 minutes max] ☰ [Volume in Millions of Gallons]

Table 30. Filtration Time Conformance - JP-8.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	1	JP8	104.2	3	7.5	7.2	11	137
1999	2	JP8	204.0	3	8.3	8.5	15	270
1999	3	JP8	1037.7	1	6.4	6.2	15	950
1999	4	JP8	92.4	4	7.0	7.2	13	198
1999	5	JP8	306.5	3	5.6	5.6	13	191
1999	7	JP8	316.7	4	9.1	9.0	31	118
1999	8	JP8	293.8	4	7.3	6.7	14	225
1999	9	JP8	47.0	5	6.0	6.0	7	7
1999	7	AN8	3.9	7	7.0	7.0	7	1
2000	1	JP8	108.9	3	7.8	7.3	12	137
2000	2	JP8	249.6	3	8.0	8.1	17	354
2000	3	JP8	1041.4	3	6.6	6.2	24	868
2000	4	JP8	101.8	3	7.8	7.8	15	225
2000	5	JP8	371.6	3	5.2	5.9	11	203
2000	7	JP8	177.5	5	9.1	7.9	15	80
2000	8	JP8	362.7	4	7.0	6.8	13	190
2000	9	JP8	122.1	4	8.5	8.8	24	16
2000	7	AN8	5.4	6	6.0	6.0	6	1
2001	1	JP8	38.4	4	7.6	7.0	13	71
2001	2	JP8	313.1	4	8.0	8.1	18	460
2001	3	JP8	1,074.1	4	6.5	6.5	22	885
2001	4	JP8	105.5	2	7.4	7.4	12	224
2001	5	JP8	443.2	1	5.1	5.7	13	282
2001	7	JP8	366.6	0	8.2	6.9	15	115
2001	8	JP8	331.6	4	7.2	6.8	14	264
2001	9	JP8	83.6	5	6.4	6.4	10	13

[Spec = 15 minutes max] ☰ [Volume in Millions of Gallons]



Table 31. Total Acid Number Conformance – F-76.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	3	F76	176.3	0.002	0.0449	0.0522	0.262	47
1999	5	F76	93.2	0.000	0.1449	0.1339	0.300	24
1999	7	F76	38.6	0.002	0.0538	0.0560	0.100	11
1999	8	F76	250.5	0.010	0.0869	0.0734	0.241	44
1999	9	F76	9.8	0.030	0.0300	0.0300	0.030	1
2000	1	F76	12.3	0.030	0.0383	0.0385	0.070	6
2000	3	F76	146.6	0.008	0.1146	0.1280	0.300	36
2000	5	F76	139.0	0.000	0.0683	0.0582	0.290	31
2000	6	F76	88.5	0.003	0.0259	0.0270	0.040	14
2000	7	F76	115.1	0.010	0.0688	0.0597	0.300	26
2000	8	F76	120.3	0.010	0.0870	0.0857	0.296	29
2001	1	F76	4.1	0.060	0.0650	0.0649	0.070	2
2001	3	F76	114.7	0.001	0.0268	0.0254	0.094	37
2001	5	F76	109.2	0.000	0.1239	0.0917	0.300	39
2001	6	F76	147.5	0.020	0.0291	0.0268	0.100	22
2001	7	F76	92.8	0.009	0.0413	0.0398	0.150	20
2001	8	F76	157.5	0.010	0.1187	0.1107	0.300	43
2001	9	F76	43.7	0.020	0.0217	0.0221	0.030	6

[Spec = 0.30 mg KOH/100mL max] ☐ [Volume in Millions of Gallons]

Table 32. Total Acid Number Conformance – JP-5.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	2	JP5	15.6	0.002	0.0067	0.0057	0.014	32
1999	3	JP5	307.6	0.001	0.0035	0.0034	0.008	117
1999	5	JP5	168.1	0.000	0.0051	0.0052	0.015	52
1999	6	JP5	62.0	0.003	0.0032	0.0032	0.005	12
1999	7	JP5	52.6	0.002	0.0041	0.0045	0.009	13
1999	8	JP5	46.9	0.005	0.0077	0.0077	0.011	10
1999	9	JP5	19.6	0.001	0.0030	0.0030	0.005	2
2000	2	JP5	8.0	0.002	0.0061	0.0062	0.011	46
2000	3	JP5	308.8	0.001	0.0036	0.0035	0.011	116
2000	5	JP5	191.6	0.000	0.0040	0.0043	0.014	103
2000	6	JP5	60.9	0.002	0.0034	0.0033	0.006	11
2000	7	JP5	57.3	0.001	0.0046	0.0048	0.007	18
2000	8	JP5	61.4	0.001	0.0046	0.0036	0.018	9
2001	2	JP5	7.5	0.001	0.0044	0.0044	0.009	43
2001	3	JP5	327.4	0.000	0.0041	0.0041	0.009	125
2001	5	JP5	196.4	0.000	0.0041	0.0040	0.013	118
2001	6	JP5	59.3	0.002	0.0028	0.0028	0.003	12
2001	7	JP5	86.9	0.003	0.0054	0.0055	0.010	23
2001	8	JP5	160.9	0.002	0.0057	0.0047	0.019	35
2001	9	JP5	9.8	0.002	0.0020	0.0020	0.002	1

[Spec = 0.015 mg KOH/g max] ☐ [Volume in Millions of Gallons]



Table 33. Total Acid Number Conformance – JP-4.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	8	JP4	1.4	0.006	0.0080	0.0084	0.011	8
2000	8	JP4	1.1	0.007	0.0085	0.0085	0.011	12
2001	8	JP4	1.6	0.001	0.0064	0.0054	0.009	7

[Spec = 0.015 mg KOH/g max] ☰ [Volume in Millions of Gallons]

Table 34. Total Acid Number Conformance – JP-8.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	1	JP8	104.2	0.002	0.0064	0.0096	0.018	137
1999	2	JP8	204.0	0.000	0.0041	0.0043	0.030	270
1999	3	JP8	1037.7	0.000	0.0067	0.0057	0.018	951
1999	4	JP8	92.4	0.000	0.0051	0.0053	0.013	198
1999	5	JP8	306.5	0.000	0.0045	0.0045	0.015	191
1999	7	JP8	316.7	0.000	0.0050	0.0059	0.014	118
1999	8	JP8	293.8	0.000	0.0123	0.0088	0.020	225
1999	9	JP8	47.0	0.001	0.0051	0.0047	0.009	7
1999	7	AN8	3.9	0.008	0.0080	0.0080	0.008	1
2000	1	JP8	108.9	0.001	0.0075	0.0087	0.159	137
2000	2	JP8	249.6	0.000	0.0035	0.0038	0.013	353
2000	3	JP8	1041.4	0.000	0.0056	0.0045	0.100	868
2000	4	JP8	101.8	0.000	0.0051	0.0046	0.015	225
2000	5	JP8	371.6	0.000	0.0058	0.0067	0.015	203
2000	7	JP8	177.5	0.000	0.0038	0.0046	0.010	81
2000	8	JP8	362.7	0.003	0.0144	0.0093	0.180	191
2000	9	JP8	122.1	0.001	0.0108	0.0109	0.090	16
2000	7	AN8	5.4	0.008	0.0080	0.0080	0.008	1
2001	1	JP8	38.4	0.001	0.0073	0.0101	0.015	71
2001	2	JP8	313.1	0.000	0.0044	0.0040	0.030	460
2001	3	JP8	1,074.1	0.000	0.0054	0.0040	0.020	886
2001	4	JP8	105.5	0.000	0.0039	0.0039	0.012	224
2001	5	JP8	443.2	0.001	0.0045	0.0046	0.030	282
2001	7	JP8	366.6	0.001	0.0042	0.0046	0.021	140
2001	8	JP8	331.6	0.001	0.0115	0.0075	0.190	264
2001	9	JP8	83.6	0.002	0.0045	0.0045	0.007	13

[Spec = 0.015 mg KOH/g max] ☰ [Volume in Millions of Gallons]



Table 35. Smoke Point Conformance – JP-5.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	2	JP5	15.6	26	26.00	26.00	26	32
1999	3	JP5	307.6	19	20.73	20.37	26	117
1999	5	JP5	168.1	18	19.94	20.23	30	53
1999	6	JP5	62.0	21	22.83	22.85	26	12
1999	7	JP5	52.6	20	22.00	22.41	25	13
1999	8	JP5	46.9	22	23.60	23.60	25	10
1999	9	JP5	19.6	20	20.00	20.00	20	2
2000	2	JP5	8.0	26	26.00	26.00	26	46
2000	3	JP5	308.8	19	21.16	20.86	27	116
2000	5	JP5	191.6	19	19.74	19.71	22	103
2000	6	JP5	60.9	20	22.36	22.33	25	11
2000	7	JP5	57.3	21	21.78	22.03	25	18
2000	8	JP5	61.4	20	23.17	23.44	25	12
2001	2	JP5	7.5	26	26.00	26.00	26	44
2001	3	JP5	327.4	19	21.14	20.90	26	125
2001	5	JP5	196.4	19	19.57	19.49	23	118
2001	6	JP5	59.3	23	24.25	24.26	26	12
2001	7	JP5	86.9	19	21.26	21.24	22	23
2001	8	JP5	160.9	19	22.94	23.28	25	35
2001	9	JP5	9.8	28	28.00	28.00	28	1

[Spec = 19.0 mm min] ☰ [Volume in Millions of Gallons]



Table 36. Smoke Point Conformance – JP-4.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	8	JP4	1.4	23	26.38	26.97	30	8
2000	8	JP4	1.1	26	29.50	27.38	34	12
2001	8	JP4	1.6	32	32.86	32.89	34	7

[Spec = 20.0 mm min] ☰ [Volume in Millions of Gallons]

Table 37. Smoke Point Conformance – JP-8.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	1	JP8	104.2	17	21.15	21.67	31	137
1999	2	JP8	204.0	19	24.37	24.28	43	270
1999	3	JP8	1037.7	19	23.19	22.60	44	951
1999	4	JP8	92.4	21	26.58	26.47	35	196
1999	5	JP8	306.5	18	19.94	20.04	24	199
1999	7	JP8	316.7	21	24.71	24.57	27	118
1999	8	JP8	293.8	19	21.55	22.61	35	225
1999	9	JP8	47.0	23	23.00	23.00	23	7
1999	7	AN8	3.9	25	25.00	25.00	25	1
2000	1	JP8	108.9	18	20.55	20.87	24	137
2000	2	JP8	249.6	19	24.69	24.77	45	353
2000	3	JP8	1041.4	19	22.55	21.87	32	868
2000	4	JP8	101.8	18	27.38	26.84	32	225
2000	5	JP8	371.6	18	20.14	20.43	24	203
2000	7	JP8	177.5	21	25.22	25.39	27	81
2000	8	JP8	362.7	19	21.53	22.88	27	191
2000	9	JP8	122.1	20	22.81	22.95	24	16
2000	7	AN8	5.4	26	26.00	26.00	26	1
2001	1	JP8	38.4	19	20.69	21.81	26	71
2001	2	JP8	313.1	19	24.15	23.94	27	460
2001	3	JP8	1,074.1	19	22.32	21.65	30	884
2001	4	JP8	105.5	20	26.95	26.44	32	223
2001	5	JP8	443.2	19	20.31	20.47	27	282
2001	7	JP8	366.6	21	24.85	24.98	28	139
2001	8	JP8	331.6	19	22.22	23.41	29	264
2001	9	JP8	83.6	23	23.00	23.00	23	13

[Spec = 25 mm min or 19 mm min w/ 3.0% Naphthalenes] ☰ [Volume in Millions of Gallons]



Table 38. Naphthalenes Conformance – JP-8.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	1	JP8	104.2	0.2	1.42	1.62	3.0	137
1999	2	JP8	204.0	0.2	1.36	0.91	2.8	210
1999	3	JP8	1037.7	0.0	1.38	1.12	3.0	634
1999	4	JP8	92.4	0.0	0.39	0.04	1.0	44
1999	5	JP8	306.5	0.0	1.45	1.16	3.0	197
1999	7	JP8	316.7	0.1	1.55	0.67	2.8	66
1999	8	JP8	293.8	0.2	2.02	1.53	3.0	214
1999	9	JP8	47.0	0.9	1.09	1.11	1.4	7
2000	1	JP8	108.8	0.9	1.33	1.42	3.0	136
2000	2	JP8	174.9	0.1	1.31	1.32	2.3	281
2000	3	JP8	943.1	0.0	1.43	1.40	2.9	668
2000	4	JP8	40.9	0.0	0.52	0.61	2.7	111
2000	5	JP8	371.6	0.1	1.79	1.42	3.0	203
2000	7	JP8	14.7	1.4	2.45	2.53	3.0	15
2000	8	JP8	352.9	0.5	2.03	1.42	3.0	190
2001	1	JP8	38.4	0.7	1.27	1.52	2.5	71
2001	2	JP8	249.6	0.2	1.49	1.50	2.5	393
2001	3	JP8	952.2	0.1	1.41	1.30	3.0	687
2001	4	JP8	62.2	0.0	0.80	0.97	2.9	119
2001	5	JP8	403.9	0.0	1.63	1.28	2.9	262
2001	7	JP8	99.4	0.4	1.33	1.30	2.9	56
2001	8	JP8	218.5	0.4	2.13	1.90	2.9	225
2001	9	JP8	83.6	1.2	1.44	1.43	1.6	13

[Spec = 3.0% max] ☰ [Volume in Millions of Gallons]





Table 39. Hydrogen Content Conformance – F-76.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	3	F76	176.3	12.8	13.32	13.30	15.3	47
1999	5	F76	93.2	12.5	12.86	12.84	13.1	24
1999	7	F76	38.6	13.1	13.69	13.64	15.8	11
1999	8	F76	250.5	12.6	13.14	13.13	13.7	44
1999	9	F76	9.8	13.3	13.30	13.30	13.3	1
2000	1	F76	12.3	12.9	13.35	13.35	13.6	6
2000	3	F76	146.6	12.5	13.27	13.24	14.8	36
2000	5	F76	139.0	12.6	12.76	12.75	13.0	31
2000	6	F76	88.5	13.0	13.54	13.49	14.0	14
2000	7	F76	115.1	13.2	13.63	13.71	15.5	26
2000	8	F76	120.3	12.8	13.18	13.21	13.6	29
2000	9	F76	33.1	13.3	13.31	13.31	13.4	6
2001	1	F76	4.1	13.1	13.60	13.59	14.1	2
2001	3	F76	114.7	12.5	13.47	13.51	15.7	37
2001	5	F76	109.2	12.6	12.88	12.90	13.3	39
2001	6	F76	147.5	13.1	13.66	13.61	16.6	22
2001	7	F76	92.8	12.8	13.31	13.30	13.7	20
2001	8	F76	157.5	12.7	13.46	13.39	14.8	43
2001	9	F76	43.7	13.1	13.22	13.20	13.3	6

[Spec = 12.5% min] ☰ [Volume in Millions of Gallons]

Table 40. Hydrogen Content Conformance – JP-5.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	2	JP5	15.6	13.9	14.42	15.24	15.7	32
1999	3	JP5	307.6	13.4	13.92	13.93	14.4	117
1999	5	JP5	168.1	13.4	13.60	13.64	14.2	53
1999	6	JP5	62.0	13.6	13.90	13.90	14.2	12
1999	7	JP5	52.6	13.7	14.07	14.04	15.0	13
1999	8	JP5	46.9	13.8	13.99	14.01	14.4	10
1999	9	JP5	19.6	13.7	13.78	13.77	13.9	2
2000	2	JP5	8.0	13.4	14.46	14.47	15.5	46
2000	3	JP5	308.8	13.2	14.00	14.01	14.8	116
2000	5	JP5	191.6	13.4	13.58	13.58	15.8	103
2000	6	JP5	60.9	13.6	13.85	13.84	14.1	11
2000	7	JP5	57.3	13.6	13.80	13.77	14.1	18
2001	2	JP5	7.5	13.7	13.96	13.70	14.6	43
2001	3	JP5	327.4	13.4	13.96	13.97	15.0	125
2001	5	JP5	196.4	13.4	13.57	13.55	14.3	118
2001	6	JP5	59.3	13.9	14.07	14.07	14.2	12
2001	7	JP5	86.9	13.5	13.76	13.76	14.0	23
2001	8	JP5	160.9	13.6	13.84	13.83	14.9	35
2001	9	JP5	9.8	14.4	14.40	14.40	14.4	1

[Spec = 13.4% min] ☰ [Volume in Millions of Gallons]



Table 41. Hydrogen Content Conformance – JP-4.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	8	JP4	1.4	14.5	14.58	14.55	14.7	8
2000	8	JP4	1.1	14.5	14.64	14.18	14.7	11
2001	8	JP4	1.6	14.6	14.63	14.62	14.7	7

[Spec = 13.5% min] ☰ [Volume in Millions of Gallons]

Table 42. Hydrogen Content Conformance – JP-8.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	1	JP8	104.2	13.3	13.63	13.76	14.0	137
1999	2	JP8	204.0	13.4	13.85	13.85	14.2	257
1999	3	JP8	1037.7	13.2	13.85	13.85	15.5	951
1999	4	JP8	92.4	13.4	13.85	13.79	14.2	196
1999	5	JP8	306.5	13.4	13.57	13.59	15.5	199
1999	7	JP8	316.7	13.6	13.93	13.94	15.5	118
1999	8	JP8	293.8	13.5	13.88	13.85	14.5	216
1999	9	JP8	47.0	13.7	13.81	13.80	13.9	7
1999	7	AN8	3.9	13.8	13.80	13.80	13.8	1
2000	1	JP8	108.9	13.3	13.64	13.76	14.4	137
2000	2	JP8	249.6	13.4	13.89	13.87	14.4	353
2000	3	JP8	1041.4	13.4	13.81	13.78	16.0	868
2000	4	JP8	101.8	13.3	13.95	13.85	14.6	223
2000	5	JP8	371.6	13.4	13.56	13.61	14.1	203
2000	7	JP8	177.5	13.4	13.95	13.92	15.2	80
2000	8	JP8	362.7	13.4	13.87	10.09	14.3	177
2000	9	JP8	122.1	13.4	13.67	13.66	13.8	16
2000	7	AN8	5.4	14.0	14.03	14.03	14.0	1
2001	1	JP8	38.4	13.4	13.55	13.73	14.0	71
2001	2	JP8	313.1	13.3	13.82	13.69	14.5	457
2001	3	JP8	1,074.1	13.4	13.79	13.72	17.5	885
2001	4	JP8	105.5	13.4	13.85	13.73	14.6	223
2001	5	JP8	443.2	13.0	13.57	13.60	14.2	282
2001	7	JP8	366.6	13.4	13.97	11.42	27.0	107
2001	8	JP8	331.6	13.6	13.89	13.52	14.4	258
2001	9	JP8	83.6	13.7	13.78	13.79	13.9	13

[Spec = 13.4% min] ☰ [Volume in Millions of Gallons]



Table 43. Distillation (10% Recovered) Conformance – F-76.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	3	F76	176.3	196	232.89	179.77	246	39
1999	5	F76	93.2	212	233.18	233.87	248	24
1999	7	F76	38.6	201	217.73	215.83	240	11
1999	8	F76	250.5	203	236.62	236.46	261	44
1999	9	F76	9.8	365	365.00	365.00	365	1
2000	1	F76	12.3	211	214.35	214.40	221	6
2000	3	F76	146.6	228	237.29	237.03	246	36
2000	5	F76	139.0	212	232.11	231.84	250	31
2000	6	F76	88.5	212	231.12	229.83	249	14
2000	7	F76	115.1	201	216.85	216.52	238	26
2000	8	F76	120.3	203	223.78	221.20	262	29
2001	1	F76	4.1	208	218.10	217.95	228	2
2001	3	F76	114.7	212	237.82	238.13	247	37
2001	5	F76	109.2	206	236.17	233.44	250	39
2001	6	F76	147.5	194	220.15	220.33	234	22
2001	7	F76	92.8	198	215.33	216.18	231	20
2001	8	F76	157.5	189	229.87	231.94	268	43
2001	9	F76	43.7	198	226.50	229.64	238	6

[Spec = (Report)] ☰ [Volume in Millions of Gallons]

Table 44. Distillation (10% Recovered) Conformance – JP-5.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	2	JP5	15.6	186	189.21	186.91	192	32
1999	3	JP5	307.6	171	175.73	174.40	197	117
1999	5	JP5	168.1	172	192.71	179.87	201	52
1999	6	JP5	62.0	180	188.92	188.96	191	12
1999	7	JP5	52.6	187	192.78	192.37	196	13
1999	8	JP5	46.9	191	192.95	193.16	200	10
1999	9	JP5	19.6	197	197.50	197.50	198	2
2000	2	JP5	8.0	186	189.82	189.90	198	46
2000	3	JP5	308.8	149	177.15	175.93	200	116
2000	5	JP5	191.6	185	198.31	197.95	202	103
2000	6	JP5	60.9	188	190.36	190.38	193	11
2000	7	JP5	57.3	183	191.16	191.92	198	18
2000	8	JP5	61.4	191	192.39	192.13	196	12
2001	2	JP5	7.5	186	191.83	188.21	198	43
2001	3	JP5	327.4	171	177.22	176.21	199	125
2001	5	JP5	196.4	193	197.25	197.29	201	118
2001	6	JP5	59.3	189	191.17	191.19	192	12
2001	7	JP5	86.9	187	192.13	192.00	199	23
2001	8	JP5	160.9	187	191.61	190.90	199	35
2001	9	JP5	9.8	198	197.70	197.70	198	1

[Spec = 205/206 °C max] ☰ [Volume in Millions of Gallons]



Table 45. Distillation (10% Recovered) Conformance – JP-4.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	8	JP4	1.4	88	91.00	90.54	94	8
2000	8	JP4	1.1	87	88.77	88.33	91	12
2001	8	JP4	1.6	87	89.81	89.44	91	7

[Spec = (Report)] ☰ [Volume in Millions of Gallons]

Table 46. Distillation (10% Recovered) Conformance – JP-8.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	
1999	1	JP8	104.2	164	179.00	173.61	194	137
1999	2	JP8	204.0	158	183.07	183.71	198	270
1999	3	JP8	1037.7	122	177.12	179.12	202	951
1999	4	JP8	92.4	156	172.67	170.05	189	198
1999	5	JP8	306.5	148	178.42	161.94	201	191
1999	7	JP8	316.7	163	175.04	173.86	190	118
1999	8	JP8	293.8	158	166.88	168.09	177	225
1999	9	JP8	47.0	168	172.43	172.69	176	7
1999	7	AN8	3.9	162	162.00	162.00	162	1
2000	1	JP8	108.9	169	179.98	176.41	194	137
2000	2	JP8	249.6	161	180.12	180.93	198	354
2000	3	JP8	1041.4	156	177.62	178.23	198	868
2000	4	JP8	101.8	155	170.98	170.41	187	225
2000	5	JP8	371.6	146	173.24	167.55	202	203
2000	7	JP8	177.5	158	174.01	174.73	194	81
2000	8	JP8	362.7	153	167.81	168.14	195	191
2000	9	JP8	122.1	167	172.69	172.82	178	16
2000	7	AN8	5.4	168	168.00	168.00	168	1
2001	1	JP8	38.4	169	178.95	176.49	192	71
2001	2	JP8	313.1	151	180.74	181.69	216	460
2001	3	JP8	1,074.1	158	177.24	178.10	199	886
2001	4	JP8	105.5	156	174.63	172.82	193	224
2001	5	JP8	443.2	144	178.69	171.47	201	282
2001	7	JP8	366.6	159	172.53	170.62	190	139
2001	8	JP8	331.6	156	167.65	166.30	181	264
2001	9	JP8	83.6	165	168.08	168.39	172	13

[Spec = 205/206 °C max] ☰ [Volume in Millions of Gallons]



Table 47. Final Boiling Point Conformance – F-76.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	3	F76	176.3	256	348.46	350.07	367	47
1999	5	F76	93.2	343	355.16	353.75	365	24
1999	7	F76	38.6	359	368.55	368.94	371	11
1999	8	F76	250.5	348	365.33	366.03	383	44
1999	9	F76	9.8	366	366.00	366.00	366	1
2000	1	F76	12.3	336	347.87	348.02	359	6
2000	3	F76	146.6	338	355.42	356.79	369	36
2000	5	F76	139.0	351	359.56	359.58	369	31
2000	6	F76	88.5	370	378.21	379.10	385	14
2000	7	F76	115.1	341	366.14	366.80	385	26
2000	8	F76	120.3	346	362.11	363.50	377	29
2000	9	F76	33.1	346	354.17	352.78	362	6
2001	1	F76	4.1	346	347.00	346.98	348	2
2001	3	F76	114.7	347	362.25	362.23	373	37
2001	5	F76	109.2	347	360.81	361.01	381	39
2001	6	F76	147.5	352	373.16	373.39	385	22
2001	7	F76	92.8	357	367.41	367.87	384	20
2001	8	F76	157.5	330	359.89	361.56	377	43
2001	9	F76	43.7	336	348.67	350.31	358	6

[Spec = 385 °C max] ☐ [Volume in Millions of Gallons]

Table 48. Final Boiling Point Conformance – JP-5.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	2	JP5	15.6	244	250.55	248.79	256	32
1999	3	JP5	307.6	269	283.29	283.69	297	117
1999	5	JP5	168.1	249	266.52	260.75	314	52
1999	6	JP5	62.0	250	262.58	262.25	280	12
1999	7	JP5	52.6	241	257.22	254.44	264	13
1999	8	JP5	46.9	246	247.65	247.72	252	10
1999	9	JP5	19.6	267	268.00	268.01	269	2
2000	2	JP5	8.0	244	250.98	251.04	258	46
2000	3	JP5	308.8	252	283.42	283.97	321	116
2000	5	JP5	191.6	243	260.33	260.33	283	103
2000	6	JP5	60.9	253	274.27	274.89	298	11
2000	7	JP5	57.3	233	256.03	257.79	271	18
2001	2	JP5	7.5	240	253.36	248.61	266	43
2001	3	JP5	327.4	261	278.21	278.40	294	125
2001	5	JP5	196.4	245	261.54	262.18	280	118
2001	6	JP5	59.3	246	256.58	256.32	273	12
2001	7	JP5	86.9	243	258.77	259.63	355	23
2001	8	JP5	160.9	247	270.51	271.22	292	35
2001	9	JP5	9.8	270.1	270.10	270.10	270	1

[Spec = 300 °C max] ☐ [Volume in Millions of Gallons]



Table 49. Final Boiling Point Conformance – JP-4.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	8	JP4	1.4	257	262.25	262.14	266	8
2000	8	JP4	1.1	252	256.93	257.42	261	12
2001	8	JP4	1.6	254	256.24	256.40	259	7

[Spec = 270 °C max] ☰ [Volume in Millions of Gallons]

Table 50. Final Boiling Point Conformance – JP-8.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	1	JP8	104.2	231	253.70	246.88	286	137
1999	2	JP8	204.0	201	256.85	258.08	365	270
1999	3	JP8	1037.7	217	257.44	259.72	355	951
1999	4	JP8	92.4	232	258.29	261.49	287	198
1999	5	JP8	306.5	236	260.66	253.60	310	191
1999	7	JP8	316.7	229	257.49	256.69	370	118
1999	8	JP8	293.8	178	271.02	268.02	294	225
1999	9	JP8	47.0	258	263.43	263.95	269	7
1999	7	AN8	3.9	243	243.00	243.00	243	1
2000	1	JP8	108.9	223	253.40	248.26	272	137
2000	2	JP8	249.6	239	256.01	256.12	279	354
2000	3	JP8	1041.4	217	255.86	259.07	325	868
2000	4	JP8	101.8	225	257.55	258.76	291	225
2000	5	JP8	371.6	239	272.98	286.67	350	203
2000	7	JP8	177.5	227	256.24	253.35	274	81
2000	8	JP8	362.7	244	272.09	269.84	292	191
2000	9	JP8	122.1	258	269.88	269.82	287	16
2000	7	AN8	5.4	229	229.00	229.00	229	1
2001	1	JP8	38.4	148	253.39	247.21	270	71
2001	2	JP8	313.1	243	259.97	259.32	303	460
2001	3	JP8	1,074.1	212	256.57	260.16	281	886
2001	4	JP8	105.5	227	261.03	261.52	298	224
2001	5	JP8	443.2	167	267.73	280.72	318	282
2001	7	JP8	366.6	231	256.84	254.05	356	139
2001	8	JP8	331.6	170	269.51	269.75	284	264
2001	9	JP8	83.6	262	272.23	274.09	296	13

[Spec = 300 °C max] ☰ [Volume in Millions of Gallons]



Table 51. Flash Point Conformance – F-76.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	3	F76	176.3	66	81.09	80.27	90	47
1999	5	F76	93.2	64	72.92	73.96	91	24
1999	7	F76	38.6	63	71.09	70.08	84	11
1999	8	F76	250.5	61	75.64	76.35	89	44
1999	9	F76	9.8	110	110.00	110.00	110	1
2000	1	F76	12.3	68	71.00	70.92	77	6
2000	3	F76	146.6	71	78.78	78.46	84	36
2000	5	F76	139.0	62	75.32	74.74	87	31
2000	6	F76	88.5	68	80.57	77.72	92	14
2000	7	F76	115.1	64	69.15	69.20	76	26
2000	8	F76	120.3	61	69.90	67.68	100	29
2001	1	F76	4.1	70	72.00	71.96	74	2
2001	3	F76	114.7	69	83.84	83.59	94	37
2001	5	F76	109.2	62	71.74	71.81	79	39
2001	6	F76	147.5	61	73.59	74.44	98	22
2001	7	F76	92.8	62	69.30	69.46	81	20
2001	8	F76	157.5	50	74.60	75.77	100	43
2001	9	F76	43.7	62	75.67	77.08	84	6

[Spec = 60 °C min] ☰ [Volume in Millions of Gallons]

Table 52. Flash Point Conformance – JP-5.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	2	JP5	15.6	60	62.25	60.79	66	32
1999	3	JP5	307.6	61	62.70	62.58	67	117
1999	5	JP5	168.1	57	64.25	64.09	69	53
1999	6	JP5	62.0	62	62.67	62.68	65	12
1999	7	JP5	52.6	60	62.92	62.22	67	13
1999	8	JP5	46.9	62	63.60	63.62	67	10
1999	9	JP5	19.6	63	64.00	64.01	65	2
2000	2	JP5	8.0	61	63.39	63.39	69	46
2000	3	JP5	308.8	60	62.55	62.43	67	116
2000	5	JP5	191.6	54	63.26	63.26	70	103
2000	6	JP5	60.9	60	62.45	62.52	65	11
2000	7	JP5	57.3	61	62.72	62.72	65	18
2000	8	JP5	61.4	61	62.50	62.44	64	12
2001	2	JP5	7.5	60	62.14	60.99	67	43
2001	3	JP5	327.4	61	62.61	62.53	66	125
2001	5	JP5	196.4	61	64.56	65.27	89	118
2001	6	JP5	59.3	63	64.33	64.36	67	12
2001	7	JP5	86.9	60	63.70	63.66	69	23
2001	8	JP5	160.9	60	64.00	63.08	94	35
2001	9	JP5	9.8	54	54.00	54.00	54	1

[Spec = 60 °C min] ☰ [Volume in Millions of Gallons]



Table 53. Flash Point Conformance – JP-8.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	1	JP8	104.2	42	51.58	51.70	64	137
1999	2	JP8	204.0	43	52.66	53.49	64	270
1999	3	JP8	1037.7	37	49.64	50.55	71	951
1999	4	JP8	92.4	38	45.14	43.84	57	198
1999	5	JP8	306.5	39	49.31	52.13	69	199
1999	7	JP8	316.7	38	47.59	46.79	61	118
1999	8	JP8	293.8	38	42.27	42.14	50	225
1999	9	JP8	47.0	42	42.29	42.39	43	7
1999	7	AN8	3.9	39	39.00	39.00	39	1
2000	1	JP8	108.9	38	53.78	54.72	73	137
2000	2	JP8	249.6	41	51.21	51.85	67	354
2000	3	JP8	1041.4	38	50.18	49.89	72	868
2000	4	JP8	101.8	38	47.19	46.45	65	225
2000	5	JP8	371.6	39	47.72	49.33	71	203
2000	7	JP8	177.5	38	46.94	47.50	59	81
2000	8	JP8	362.7	39	42.94	44.39	62	191
2000	9	JP8	122.1	40	43.06	43.22	47	16
2000	7	AN8	5.4	44	44.00	44.00	44	1
2001	1	JP8	38.4	42	53.18	54.05	63	71
2001	2	JP8	313.1	40	50.66	50.81	69	460
2001	3	JP8	1,074.1	38	50.07	49.65	84	886
2001	4	JP8	105.5	38	49.48	48.20	66	224
2001	5	JP8	443.2	40	49.79	50.73	88	282
2001	7	JP8	366.6	38	46.38	45.96	64	140
2001	8	JP8	331.6	39	42.49	42.20	52	264
2001	9	JP8	83.6	40	41.08	41.19	43	13

[Spec = 38 °C min] ☐ [Volume in Millions of Gallons]



Table 54. Cetane Index Conformance – F-76.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	3	F76	176.3	43.0	51.51	51.42	55.0	47
1999	5	F76	93.2	43.0	46.06	46.12	47.8	24
1999	7	F76	38.6	50.3	52.66	52.70	53.9	11
1999	8	F76	250.5	43.0	52.46	53.68	56.4	44
1999	9	F76	9.8	49.5	49.50	49.50	49.5	1
2000	1	F76	12.3	48.8	49.83	49.85	50.9	6
2000	3	F76	146.6	49.0	50.77	50.67	53.0	36
2000	5	F76	139.0	44.8	47.44	47.46	51.0	31
2000	6	F76	88.5	52.0	53.74	41.94	55.7	9
2000	7	F76	115.1	50.6	53.03	52.63	57.1	26
2000	8	F76	120.3	48.0	52.62	52.72	56.0	29
2000	9	F76	33.1	47.1	50.20	49.78	51.8	5
2001	1	F76	4.1	48.4	48.55	48.55	48.7	2
2001	3	F76	114.7	50.5	52.79	52.78	56.7	37
2001	5	F76	109.2	43.0	46.93	47.37	49.4	39
2001	6	F76	147.5	52.0	54.24	54.74	58.0	22
2001	7	F76	92.8	48.5	52.39	52.72	58.0	20
2001	8	F76	157.5	43.0	51.66	52.27	58.2	43
2001	9	F76	43.7	49.4	50.68	50.52	51.9	6

[Spec = 42 min] ☰ [Volume in Millions of Gallons]

Table 55. Cetane Index Conformance – JP-5.

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	2	JP5	15.6	41.7	43.58	42.38	44.9	32
1999	3	JP5	307.6	43.1	47.31	47.47	49.0	117
1999	5	JP5	168.1	20.0	37.97	39.26	45.0	53
1999	6	JP5	62.0	42.9	46.12	46.16	49.0	12
1999	7	JP5	52.6	42.1	44.18	44.90	48.2	13
1999	8	JP5	46.9	46.0	47.20	47.23	49.0	10
1999	9	JP5	19.6	44.9	45.20	45.20	45.5	2
2000	2	JP5	8.0	40.6	43.64	43.65	45.6	46
2000	3	JP5	308.8	44.8	47.71	47.76	49.6	116
2000	5	JP5	191.6	33.0	39.90	39.37	43.7	103
2000	6	JP5	60.9	44.0	45.98	45.94	48.6	11
2000	7	JP5	57.3	15.0	42.58	43.23	49.0	18
2000	8	JP5	61.4	42.5	46.29	46.57	48.0	12
2001	2	JP5	7.5	39.3	44.66	42.92	47.3	42
2001	3	JP5	327.4	45.8	47.62	47.67	48.9	125
2001	5	JP5	196.4	32.8	39.98	38.84	44.3	118
2001	6	JP5	59.3	44.7	46.77	46.76	48.2	12
2001	7	JP5	86.9	39.9	42.74	42.74	45.0	23
2001	8	JP5	160.9	41.5	45.45	45.79	47.3	35
2001	9	JP5	9.8	45.2	45.20	45.20	45.2	1

[Spec = (Report)] ☰ [Volume in Millions of Gallons]

**Table 56. Cetane Index Conformance – JP-8.**

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1999	1	JP8	104.2	34.8	39.52	40.05	50.0	137
1999	2	JP8	204.0	39.0	43.63	43.50	48.5	270
1999	3	JP8	1037.7	11.0	43.47	44.16	50.5	950
1999	4	JP8	92.4	37.3	43.20	42.43	49.0	198
1999	5	JP8	306.5	32.5	38.98	39.37	43.8	199
1999	7	JP8	316.7	37.3	44.07	44.17	48.9	118
1999	8	JP8	293.8	37.1	41.30	39.23	48.2	216
1999	9	JP8	47.0	43.2	45.76	45.61	47.8	7
1999	7	AN8	3.9	37.6	37.60	37.60	37.6	1
2000	1	JP8	108.9	35.0	39.49	39.76	43.3	137
2000	2	JP8	249.6	39.2	43.79	43.65	51.2	353
2000	3	JP8	1041.4	32.3	42.56	42.45	52.1	860
2000	4	JP8	101.8	37.3	44.01	43.54	50.5	225
2000	5	JP8	371.6	33.4	39.39	40.11	44.1	203
2000	7	JP8	177.5	37.5	45.15	45.27	49.0	80
2000	8	JP8	362.7	37.0	41.74	32.25	48.8	171
2000	9	JP8	122.1	43.5	45.41	38.36	47.1	14
2000	7	AN8	5.4	45.5	45.50	45.50	45.5	1
2001	1	JP8	38.4	35.2	39.04	39.83	43.0	71
2001	2	JP8	313.1	38.7	46.22	44.38	60.2	460
2001	3	JP8	1,074.1	10.9	42.50	43.13	54.8	885
2001	4	JP8	105.5	37.0	43.20	43.17	47.6	224
2001	5	JP8	443.2	33.5	39.62	39.63	46.1	281
2001	7	JP8	366.6	34.0	44.06	33.74	49.6	96
2001	8	JP8	331.6	38.0	42.39	43.44	49.4	263
2001	9	JP8	83.6	43.0	44.91	45.08	48.1	13

[Spec = (Report)] ☐ [Volume in Millions of Gallons]



Table 57. Combustion Net Heat Conformance – JP-5.

Year	Region	Fuel	Volume	AG			BTU			MJ		
				Min	Avg	Max	Min	Avg	Max	Min	Avg	Max
1999	2	JP5	6.3	—	—	—	18,579	18,594.5	18,611	—	—	—
1999	3	JP5	307.6	5,427	6,144.9	6,403	18,567	18,584.9	18,599	43.1	43.22	43.5
1999	5	JP5	168.1	5,136	5,226.1	5,393	18,374	18,463.6	18,495	43.0	43.00	43.0
1999	6	JP5	62.0	—	—	—	—	—	—	43.0	43.22	43.4
1999	7	JP5	54.3	—	—	—	—	—	—	42.5	43.15	43.4
1999	8	JP5	46.9	—	—	—	—	—	—	43.3	43.68	46.4
1999	9	JP5	19.6	6,135	6,135	6,135	—	—	—	43.1	43.11	43.1
2000	2	JP5	8.0	—	—	—	18,575	18,601.3	18,635	—	—	—
2000	3	JP5	308.8	—	—	—	18,563	18,583.0	18,594	43.2	43.23	43.9
2000	5	JP5	191.6	4,500	5,231.9	5,491	18,413	18,457.2	18,485	42.6	42.98	43.1
2000	6	JP5	60.9	—	—	—	—	—	—	43.1	43.29	43.9
2000	7	JP5	57.3	—	—	—	—	—	—	43.1	43.20	43.3
2000	8	JP5	61.4	—	—	—	—	—	—	43.2	43.28	43.3
2001	2	JP5	7.5	—	—	—	18,593	18,614.2	18,640	43.2	43.28	43.3
2001	3	JP5	327.4	—	—	—	18,569	18,577.3	18,589	43.2	43.22	43.7
2001	5	JP5	196.4	—	—	—	—	—	—	42.8	43.01	43.2
2001	6	JP5	59.3	—	—	—	—	—	—	43.2	43.33	43.4
2001	7	JP5	86.9	—	—	—	—	—	—	43.0	43.16	43.3
2001	8	JP5	160.9	—	—	—	18,558	18,558.0	18,558	43.0	43.26	43.6
2001	9	JP5	9.8	—	—	—	—	—	—	43.1	43.10	43.1

[Spec: Aniline-G. = 4500 min, Net Heat = 18300 BTU or 42.6 MJ/kg min] ☰ [Volume in Millions of Gallons]



Table 58. Combustion Net Heat Conformance – JP-4.

Year	Region	Fuel	Volume	AG			BTU			MJ		
				Min	Avg	Max	Min	Avg	Max	Min	Avg	Max
1999	8	JP4	1.2	—	—	—	—	—	—	43.8	43.84	43.9
2000	8	JP4	1.1	—	—	—	18,753	18,857.0	18,882	43.6	43.84	43.9
2001	8	JP4	1.6	—	—	—	18,766	18,814.3	18,882	43.6	43.74	43.9

[Spec: Aniline-G. = 4500 min, Net Heat = 18385 BTU or 42.8 MJ/kg min] ☐ [Volume in Millions of Gallons]

Table 59. Combustion Net Heat Conformance – JP-8.

Year	Region	Fuel	Volume	AG			BTU			MJ		
				Min	Avg	Max	Min	Avg	Max	Min	Avg	Max
1999	1	JP8	104.2	—	—	—	—	—	—	43.0	43.15	43.5
1999	2	JP8	207.9	—	—	—	18,400	18,594.3	18,650	43.1	43.37	43.5
1999	3	JP8	1024.9	—	—	—	18,400	18,586.9	18,727	42.2	43.27	44.0
1999	4	JP8	92.4	—	—	—	18,265	18,598.9	18,860	43.0	43.33	45.0
1999	5	JP8	308.4	—	—	—	18,448	18,506.3	18,612	42.1	43.04	43.1
1999	7	JP8	463.5	—	—	—	18,610	18,658.1	18,864	43.0	43.25	43.9
1999	8	JP8	302.4	—	—	—	18,508	18,553.5	18,754	43.2	43.34	44.3
1999	9	JP8	66.0	—	—	—	—	—	—	43.2	43.27	43.3
2000	1	JP8	108.9	—	—	—	—	—	—	43.0	43.14	43.3
2000	2	JP8	249.6	—	—	—	18,400	18,610.1	18,643	43.0	43.23	43.4
2000	3	JP8	1041.4	18,628	18,628	18,628	18,197	18,573.4	18,692	13.1	43.17	43.6
2000	4	JP8	101.8	—	—	—	18,464	18,631.9	18,717	43.1	43.33	43.6
2000	5	JP8	371.6	—	—	—	18,419	18,538.8	18,595	42.8	43.04	43.8
2000	7	JP8	177.5	—	—	—	—	—	—	43.0	43.31	46.4
2000	8	JP8	362.7	—	—	—	18,499	18,561.2	18,704	43.2	43.32	43.5
2000	9	JP8	122.1	—	—	—	—	—	—	43.1	43.22	43.3
2000	7	AN8	5.4	—	—	—	—	—	—	43.3	43.34	43.3
2001	1	JP8	38.4	—	—	—	—	—	—	43.0	43.10	43.3
2001	2	JP8	313.1	—	—	—	18,488	18,617.3	18,696	42.9	43.20	46.3
2001	3	JP8	1074.1	—	—	—	18,481	18,584.9	18,862	41.2	43.22	44.3
2001	4	JP8	105.5	—	—	—	18,418	18,605.0	18,698	43.1	43.34	44.0
2001	5	JP8	443.3	—	—	—	18,463	18,555.1	18,585	42.8	43.06	44.1
2001	7	JP8	366.7	—	—	—	—	—	—	41.4	43.24	45.3
2001	8	JP8	331.6	—	—	—	18,454	18,572.0	18,738	42.0	43.23	47.5
2001	9	JP8	83.6	—	—	—	—	—	—	43.2	43.25	43.3

[Spec: Aniline-G. = 4500 min, Net Heat = 18300 BTU or 42.6 MJ/kg min] ☐ [Volume in Millions of Gallons]



Table 60. Viscosity Conformance – F-76.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	3	F76	176.34	2.70	3.057	3.122	3.60	47
1999	5	F76	93.17	2.80	3.413	3.481	4.20	24
1999	7	F76	38.57	2.00	2.888	2.866	3.80	11
1999	8	F76	250.53	2.78	3.646	3.631	4.30	44
1999	9	F76	9.79	4.18	4.180	4.180	4.18	1
2000	1	F76	12.3	2.31	2.605	2.609	2.90	6
2000	3	F76	146.6	2.60	3.315	3.331	3.85	36
2000	5	F76	139.0	3.00	3.800	3.814	4.30	31
2000	6	F76	88.5	2.91	3.524	3.515	4.30	14
2000	7	F76	115.1	2.53	2.910	2.889	3.37	26
2000	8	F76	120.3	2.70	3.264	3.207	4.30	29
2001	1	F76	4.12	2.50	2.500	2.500	2.50	2
2001	3	F76	114.69	2.60	3.158	3.152	4.02	37
2001	5	F76	109.17	2.50	3.643	3.686	4.20	39
2001	6	F76	147.49	2.80	3.265	3.271	3.90	22
2001	7	F76	92.83	2.30	2.778	2.807	3.39	20
2001	8	F76	157.47	2.17	3.366	3.430	4.30	43
2001	9	F76	43.75	2.38	2.933	2.977	3.19	6

[Spec = 1.7 – 4.3 cst @ 40 °C] ☰ [Volume in Millions of Gallons]

Table 61. Viscosity Conformance – JP-5.

Year	Region	Volume	Min	Avg	Wt Avg	Max	Count	
1999	2	JP5	15.58	4.60	4.98	4.931	6.80	32
1999	3	JP5	307.56	4.60	5.04	4.961	6.48	117
1999	5	JP5	168.06	4.40	6.19	6.006	7.70	53
1999	6	JP5	62.01	4.36	5.10	5.089	5.61	12
1999	7	JP5	52.63	3.63	4.60	4.606	5.69	13
1999	8	JP5	46.87	4.50	4.77	4.837	5.50	10
1999	9	JP5	19.63	5.62	5.72	5.726	5.83	2
2000	2	JP5	8.0	4.50	5.048	5.041	6.80	46
2000	3	JP5	308.8	4.60	5.074	5.008	6.95	116
2000	5	JP5	191.6	5.20	6.419	6.379	7.20	103
2000	6	JP5	60.9	3.42	5.336	5.376	6.70	11
2000	7	JP5	57.3	3.70	4.662	4.763	5.40	18
2000	8	JP5	61.4	4.60	5.107	5.089	5.75	12
2001	2	JP5	7.52	4.60	5.163	5.053	6.00	43
2001	3	JP5	327.42	4.30	5.046	4.984	6.74	125
2001	5	JP5	196.44	5.40	6.294	6.339	8.50	118
2001	6	JP5	59.29	4.45	4.879	4.871	5.10	12
2001	7	JP5	86.91	3.70	4.892	4.864	6.07	23
2001	8	JP5	160.94	2.69	5.427	5.407	6.37	35
2001	9	JP5	9.83	5.90	5.900	5.900	5.90	1

[Spec = 8.5 mm²/s @ -20 °C max] ☰ [Volume in Millions of Gallons]



Table 62. Viscosity Conformance – JP-8.

Year	Region	Fuel	Volume	Min		Wt Avg	Max	Count
1999	1	JP8	104.17	2.78	4.11	3.608	7.70	137
1999	2	JP8	204.00	3.79	4.76	4.795	7.40	268
1999	3	JP8	1037.72	2.26	4.36	4.319	8.00	948
1999	4	JP8	92.41	2.20	4.03	4.048	6.50	198
1999	5	JP8	306.48	3.40	4.83	5.187	6.90	199
1999	7	JP8	316.74	2.83	4.14	4.028	6.62	118
1999	8	JP8	293.85	2.70	4.02	4.005	5.30	225
1999	9	JP8	47.03	3.83	4.11	4.146	4.30	7
1999	7	AN8	3.92	3.78	3.78	3.780	3.78	1
2000	1	JP8	108.9	2.78	4.424	4.075	6.48	137
2000	2	JP8	249.6	3.28	4.557	4.605	6.20	353
2000	3	JP8	1041.4	2.00	4.161	4.191	6.60	868
2000	4	JP8	101.8	2.10	3.867	3.888	6.80	225
2000	5	JP8	371.6	3.10	4.888	4.883	6.80	203
2000	7	JP8	177.5	3.01	4.052	4.021	5.23	81
2000	8	JP8	362.7	2.47	4.063	3.904	5.44	191
2000	9	JP8	122.1	2.92	4.109	4.140	4.90	16
2000	7	AN8	5.4	3.59	3.590	3.590	3.59	1
2001	1	JP8	38.36	3.51	4.330	4.046	6.11	71
2001	2	JP8	313.10	2.60	4.605	4.676	6.70	460
2001	3	JP8	1,074.10	0.40	4.123	4.239	8.00	886
2001	4	JP8	105.52	2.61	4.191	4.145	6.40	224
2001	5	JP8	443.25	3.60	5.081	5.086	7.00	282
2001	7	JP8	366.65	2.37	3.932	3.904	5.40	140
2001	8	JP8	331.57	0.36	4.079	3.963	4.90	264
2001	9	JP8	83.58	3.81	4.057	4.111	4.28	13

[Spec = 8.0 mm²/s @ -20 °C max] ☐ [Volume in Millions of Gallons]



Table 63. Freezing Point Conformance – JP-5.

Year	Region	Fuel	Volume			Wt Avg	Max	Count
1999	2	JP5	15.6	-56.00	-52.844	-54.839	-46.00	32
1999	3	JP5	307.6	-51.10	-47.637	-47.580	-42.00	117
1999	5	JP5	168.1	-71.00	-60.436	-48.067	-47.00	39
1999	6	JP5	62.0	-54.00	-51.417	-51.401	-49.00	12
1999	7	JP5	52.6	-75.00	-54.262	-52.464	-46.00	13
1999	8	JP5	46.9	-55.00	-49.500	-49.606	-47.00	10
1999	9	JP5	19.6	-49.00	-48.505	-48.497	-48.00	2
2000	2	JP5	8.0	-54.00	-52.804	-52.797	-51.00	46
2000	3	JP5	308.8	-50.00	-47.478	-47.463	-44.00	116
2000	5	JP5	191.6	-63.00	-54.439	-30.563	-46.00	54
2000	6	JP5	60.9	-53.00	-50.546	-50.548	-48.00	11
2000	7	JP5	57.3	-62.78	-54.827	-54.480	-46.50	18
2000	8	JP5	61.4	-51.00	-48.042	-47.832	-47.00	12
2001	2	JP5	7.52	-54.00	-51.674	-50.745	-48.00	43
2001	3	JP5	327.42	-65.00	-48.069	-48.083	-46.00	125
2001	5	JP5	196.44	-78.00	-52.761	-54.768	-46.00	118
2001	6	JP5	59.29	-56.00	-52.417	-52.462	-49.00	12
2001	7	JP5	86.91	-80.00	-58.872	-58.067	-48.00	23
2001	8	JP5	160.94	-52.90	-49.523	-49.613	-47.00	35

[Spec = -46 °C max] ☰ [Volume in Millions of Gallons]



Table 64. Freezing Point Conformance – JP-4.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	8	JP4	1.42	-65.00	-61.375	-61.157	-58.00	8
2000	8	JP4	1.1	-82.00	-66.750	-68.733	-61.00	12
2001	8	JP4	1.55	-66.00	-63.214	-63.142	-61.00	7

[Spec = -58 °C max] ☰ [Volume in Millions of Gallons]

Table 65. Freezing Point Conformance – JP-8.

Year	Region	Fuel	Volume	Min	Avg	Wt Avg	Max	Count
1999	1	JP8	104.17	-66.00	-57.334	-56.863	-52.00	137
1999	2	JP8	204.00	-61.00	-50.256	-50.492	-47.00	269
1999	3	JP8	1037.72	-63.54	-50.333	-50.579	-2.00	951
1999	4	JP8	92.41	-63.00	-50.533	-49.978	-47.00	198
1999	5	JP8	306.48	-70.60	-54.119	-54.200	-47.00	199
1999	7	JP8	316.74	-60.00	-51.657	-51.655	-47.00	118
1999	8	JP8	293.85	-60.00	-50.643	-50.333	-47.00	225
1999	9	JP8	47.03	-67.00	-54.857	-55.043	-48.00	7
1999	7	AN8	3.92	-62.80	-62.800	-62.800	-62.80	1
2000	1	JP8	108.9	-68.00	-59.818	-57.485	-50.00	137
2000	2	JP8	249.6	-62.00	-50.162	-50.471	-46.20	354
2000	3	JP8	1041.4	-66.00	-52.079	-52.271	-46.00	868
2000	4	JP8	101.8	-63.00	-50.500	-50.359	-47.00	225
2000	5	JP8	371.6	-68.00	-55.069	-54.486	-47.00	203
2000	7	JP8	177.5	-62.00	-50.419	-49.678	-47.00	81
2000	8	JP8	362.7	-60.00	-49.789	-49.985	-47.00	191
2000	9	JP8	122.1	-60.00	-50.806	-50.204	-46.00	16
2000	7	AN8	5.4	-58.90	-58.900	-58.900	-58.90	1
2001	1	JP8	38.36	-67.00	-62.493	-58.223	-51.00	71
2001	2	JP8	313.10	-64.00	-51.189	-51.564	-47.00	460
2001	3	JP8	1,074.10	-70.00	-52.936	-52.559	-47.00	886
2001	4	JP8	105.52	-64.00	-52.405	-51.178	-47.00	224
2001	5	JP8	443.25	-78.00	-55.114	-53.966	-46.00	280
2001	7	JP8	366.65	-66.00	-52.268	-51.650	-47.00	140
2001	8	JP8	331.57	-59.80	-50.858	-50.468	-47.00	264
2001	9	JP8	83.58	-51.00	-48.769	-48.597	-47.00	13

[Spec = -47 °C max] ☰ [Volume in Millions of Gallons]



Conclusions

Test properties reported in this section are further divided into JP5, JP8 and, where applicable, F76. Aviation fuel histograms for years 1998, 1999, and 2000 were compared against 2001 for trends in statistical values. Charts showing regional statistics were also reviewed. Trends noted in this section are general in nature. A very large percentage of the fuels met all specification requirements. In the few batches where test results were off-specification, they were waived, reported incorrectly by the refiner, or transcribed into the database incorrectly. Transcription errors occurred in a very small number of the total reported batches, many of which were due to illegible paper copies. Transcription errors found during review for publication were changed, when the correct value was known, in the supporting data tables on the accompanying CD.

Of particular interest are the results for Total Sulfur. In efforts to reduce greenhouse gas emissions, the allowable sulfur in both marine/ground diesel fuel and aviation fuel either have been or are proposed to be lowered, in order to reduce sulfur dioxide formation. Data in this report shows that 96.7% of JP5 met a standard of 0.20% sulfur or lower and that 96.6% of JP8 met a standard of 0.21% or lower for fuel purchased under DESC contracts. Sulfur can be lowered either by using lower sulfur crude oils or by a desulfurization refining technique.

API Gravity

JP5: All fuel met specification limits. Verified that the one result of "52.7" should be "42.7".

Histograms show a decrease in the lighter end of the range with the volume procured within the 44-45 °API ranges increasing over the past years to almost half the total volume. Table 8 shows that Region 5 produces the heaviest JP5.

JP8: All fuel met specification limits. Histograms show a gradual shift towards heavier JP8 as reflected in the Mean values. Table 10 shows that Region 5 produces the heaviest JP8, although their JP8 is lighter than their JP5.

F76: All fuel met specification limits. Table 7 shows that Region 5 produces the heaviest F76. The other regions seem to be trending towards slightly heavier F76.

Aromatics

JP5: All fuel met specification limits. Histograms show that the double node, so pronounced for 2000, has almost disappeared for 2001. Table 11 shows an overall decline in the higher percentage fuels.

JP8: All fuel met specification limits. Histograms show a consistent Mean value, but trend towards a flattening mid-range with more fuel creeping into the lower ranges. Table 13 confirms the decreasing minimum values across most regions.

Olefins

(No longer required to be checked; still reported by some refineries with the aromatics results)

JP5: Histograms show an increase in the Mean value, with a large jump between 2000 and 2001, as well as a flattening of the curve. Table 14 confirms the increasing trend, particularly in Region 5.

JP8: Histograms and Table 16 show the same general trends as for JP5.

Total Sulfur

JP5: All fuel met specification requirements. Histograms show that while over 45% of the fuel is purchased at or below 500 ppm of sulfur, a node has shifted from 0.05% – 0.1% to 0.1% – 0.15% for 2001. The one outlier (Region 8), reported the sulfur value as "<0.40" rather than an actual number. Table 18 shows Region 6 with the lowest sulfur values.



- JP8: The two off-specification results were verified on the test reports. One was reported incorrectly. Histograms show a consistent Mean Value and a slight flattening of lower ranges. Table 20 shows Region 4 with the lowest sulfur.
- F76: The one off-specification result was verified on the test report. Table 17 shows Regions 1 and 9 with very low sulfur.

Mercaptan Sulfur

(Not required if Doctor Test is Negative)

- JP5: All fuel met specification limits. Table 21 shows no result higher than “0.0020”. Histograms show 2001 with a higher percentage of JP5 between 0.00175 and 0.0020 for 2001 than in the past years. The Mean values show a slight increase. Table 21 shows Regions 2, 5 and 7 with the lowest average values.
- JP8: A sampling of the off-specification results was verified on the test reports. Histograms show a consistent Mean value and a more pronounced node at 0.00075% – 0.001%. Table 23 shows Regions 1 and 9 with the lowest average values.

Particulate Contamination

- JP5: All fuel met specification limits. Histograms show consistent Mean values and the same relative curve shape. Table 25 shows Region 2 has the fuel with the highest average and maximum values.
- JP8: The one off-specification report was verified on the test report. It is suspected that the filtration time was entered instead of the PC value. Histograms show PC increasing in Mean value for 2001 and the higher ranges of PC values increasing. Table 27 shows all Regions except Region 1 averaging within .03 – 0.4.
- F76: All fuel met specification limits. Table 24 shows Region 3 with decreasing maximums and Regions 5, 6, and 7 with the highest maximums.

Filtration Time

- JP5: All JP5 met specification limits. Histograms show the same relative shape with most of the fuel occurring between 3-5 minutes. Table 28 shows a decreasing trend in times.
- JP8: The one off-specification result was waived. Histograms show the same relative shape with most of the fuel occurring between 5-9 minutes. Table 29 shows a consistency in averages over all Regions.

Total Acid Number

- JP5: The one off-specification result was verified on the test report. Histograms show that the decreasing trend in Mean value leveled off in 2001. The node for 2001 shifted to 0.004 – 0.005. Table 32 shows that average values are increasing for most Regions.
- JP8: A sampling of the off-specification results was verified on the test reports. Histograms show a decreasing percentage of fuel failing this property and a leveling-off of the curve at the lower end; with the Mean value decreasing. Table 34 shows a decrease in the average values across most Regions.
- F76: All fuel met specification limits. Table 31 shows a decreasing trend in the averages over all Regions. Regions 1, 6, and 9 had the lowest averages.

Smoke Point

- JP5: All fuel met specification limits. Histograms show a stable Mean value, yet increasing values in the higher ranges. Volume at range 19–21 decreased from 2000 to 2001 from 62.8% to 53.4%. Table 35 shows this increase occurring mainly in Region 6.
- JP8: All fuel met specification limits. Histograms show the same basic shape and consistent Mean values. Table 37 shows both increasing and decreasing trends across all regions.



Naphthalenes

JP8: All fuel met specification limits. Histograms show the same basic shape of the curve with consistent Mean values. Table 38 verifies this trend with Region 8 producing the highest average values.

Hydrogen Content

JP5: All fuel met specification limits. Histograms show consistent Mean values and a more pronounced node at 13.8 – 14 for 2001 than for 2000. Table 40 shows consistent average and maximum values.

JP8: Off-specification results were verified on the test reports. Histograms show the same basic shape and consistent Mean values. Table 42 shows consistent average and maximum values.

F76: All fuel met specification limits. Table 39 shows consistent averages across all Regions.

Flash Point

JP5: The one off-specification result was verified on the test report. Histograms show a stable Mean value and the same basic shape of the curve. Table 52 shows an increase in average values in Regions 6 and 7.

JP8: All fuel met specification limits. Histograms show a consistent Mean value and a slight shift in the curve towards higher flash points. Table 53 shows relatively stable averages.

F76: All fuel met specification limits. Verified that the one result of “50” should be “60”.

Table 51 shows a decreasing trend in average values for each Region except Region 8, which shows an increase.

Cetane Index

JP5: This property is a report only. Histograms show a more pronounced node at the 45 – 48 range. The shape of the curve seems to be moving towards higher cetane values, although the Mean values are consistent. Table 55 shows this general movement in the average and maximum values.

JP8: This property is a report only. Histograms show the same basic shape with consistent Mean values. Table 56 shows increases and decreases in trends for average values.

F76: All fuel met specification limits. Table 54 shows an overall decreasing trend in average values across all Regions.

Viscosity

JP5: All fuel met specification limits. Histograms show a trend towards higher viscosity values. Table 61 shows increasing and decreasing trends across the Regions.

JP8: All fuel met specification limits. Histograms show a more pronounced node at the 3.8 – 4.4 range. Table 62 shows a consistent Mean value,

F76: All fuel met specification limits. Table 60 shows a decreasing trend in average values for most Regions.

Freezing Point

JP5: All fuel met specification limits. Histograms show a consistent Mean value and a more pronounced node at the -46 to -49 range with less fuel at the -61 to -64 range.

JP8: The eight off specification results were for one refiner for no more than 1 °C higher than the specification. Histograms show a decreasing trend in Mean values towards lower freeze points. Table 65 shows no discernable trends.



Appendix – Jet Fuel Thermal Oxidation Stability Tester (JFTOT)

JFTOT Test Results at test temperatures of 260 °C vs. 275 °C.

This Appendix follows on reporting of the 2000 report, illustrating JFTOT results for JP5 and JP8 reported at test temperatures of 260 °C and 275 °C. This data is extracted and presented to more readily track trends in reporting at the two test result temperatures. Although contractors are not required to report results at both, most have been doing so. As such, this coverage in future issues of this report may become unnecessary, to provide data for equating JFTOT results in support of the efforts of the December 1998 ASTM conference on the issue.

DESC Contracts provide for two options in performing and reporting JFTOT. The first, Option A, states a test at 275 °C will be performed (report only results) in addition to the 260 °C test required by the specifications. The test at 260 °C is used as the basis for acceptance. The second option, Option B, states that the fuel can be tested at 275 °C against the limits cited in the specifications (tube deposit rating of 3 max and pressure differential of 25 mm Hg max). Acceptance is based on the 275 °C results. If the test fails at 275 °C, then perform an additional test at 260 °C. In this case, the results at 260 °C will be the basis for product acceptance with the 275 °C results also reported. If results for both temperatures are reported, then the 260 °C results will always be used as the basis for acceptance or rejection, even if both are passing results. JFTOT test results are entered into the PQIS database with unique Test Method codes to differentiate the test temperature employed.

The following table contrasts the number of JFTOT test results reported at 275 °C with that still only reported at 260 °C, each with the volume of product represented. Of the fuel reported at 260 °C in 2001, less than 15% had questionable results at 275 °C, requiring retesting at the lower temperature.

Table 66. JFTOT Test Temperatures.

Year	Fuel	Test Temperature	Count	Volume
1999	JP5	260 °C	58	178.06
1999	JP5	275 °C	185	486.62
1999	JP8	260 °C	206	330.06
1999	JP8	275 °C	1994	2239.57
1999	AN8	260 °C	1	
2000	JP5	260 °C	26	67.38
2000	JP5	275 °C	280	620.55
2000	JP8	260 °C	241	345.00
2000	JP8	275 °C	1834	2190.48
2000	AN8	260 °C	1	5.38
2001	JP5	260 °C	149	332.14
2001	JP5	275 °C	209	516.20
2001	JP8	260 °C	421	579.30
2001	JP8	275 °C	1921	2176.82

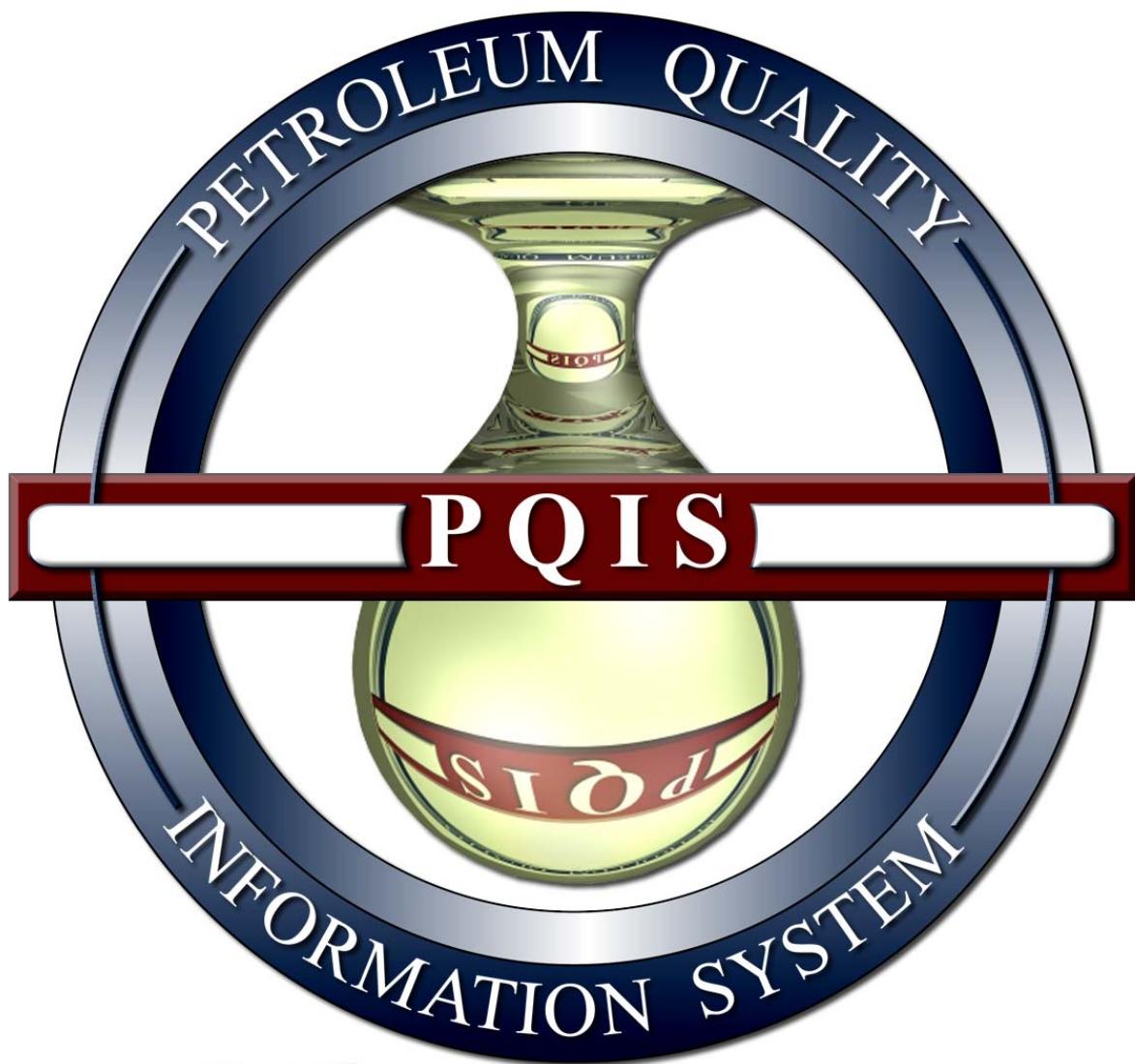
[Volume in Millions of Gallons]



Table 67. JFTOT Test Temperatures – Per Region.

Fuel	Region	Temp	1999		2000		2001	
			Count	Volume	Count	Volume	Count	Volume
JP5	2	275°C	35	6.27	46	8.00	34	5.90
	2	260°C	22	51.44	1	4.20	10	1.62
	3	275°C	95	256.12	115	304.61	125	327.42
	5	260°C	29	79.70	24	59.06	104	160.59
	5	275°C	24	88.36	79	132.50	14	35.84
	6	275°C	12	62.01	11	60.88	12	59.29
	7	275°C	5	27.29	1	4.11	23	86.91
	8	260°C	9	26.99	17	53.16	34	160.10
	8	275°C	—	—	—	—	1	0.84
	9	260°C	10	46.87	12	61.41	1	9.83
JP8	1	275°C	137	104.17	137	108.86	71	38.36
	2	260°C	26	12.8	15	16.34	396	254.65
	2	275°C	253	195.09	339	233.21	64	58.45
	3	260°C	57	103.71	62	87.49	817	876.86
	3	275°C	902	921.20	806	953.86	70	197.24
	4	260°C	4	0.96	1	0.35	218	98.83
	4	275°C	194	91.44	224	101.47	7	6.69
	5	260°C	32	57.18	52	61.68	217	372.83
	5	275°C	169	251.21	151	309.89	65	70.41
	6	275°C	—	—	—	—	—	—
	7	260°C	39	111.41	29	116.06	117	304.61
	7	275°C	144	352.07	52	61.40	23	62.04
	8	260°C	48	43.98	82	63.07	156	269.04
	8	275°C	184	258.44	109	299.67	108	62.53
	9	275°C	10	65.97	16	122.11	13	83.58
AN8	7	260°C	1	3.92	1	5.38	—	—

[(NR) = Not Recorded] ☐ [Volume in Millions of Gallons]



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